

Volume 15 Thailand to VTOL

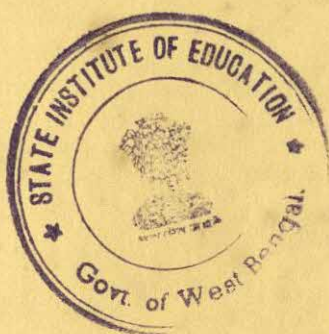
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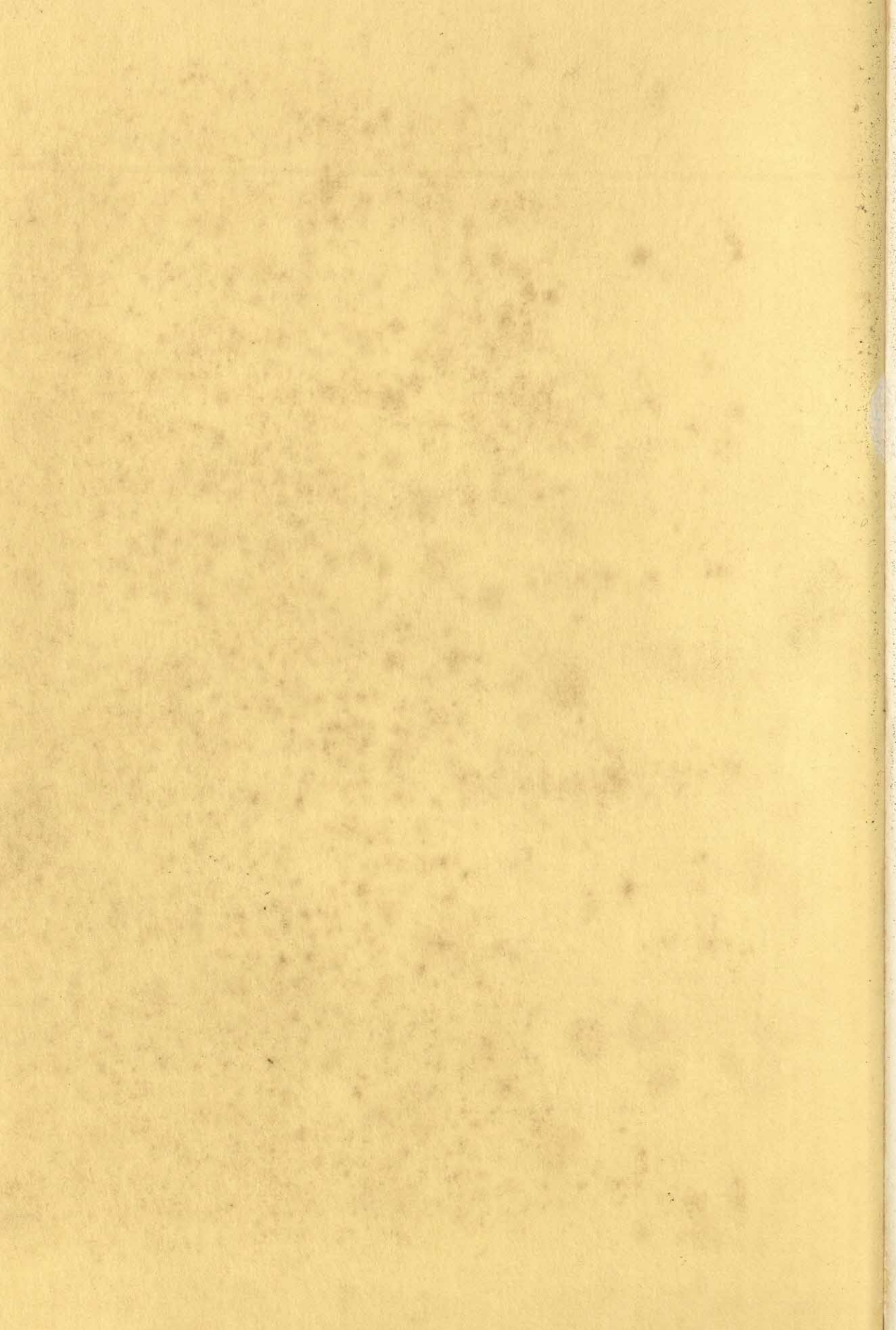
The GOLDEN BOOK ENCYCLOPEDIA



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5001



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Thailand to VTOL

THAILAND (TY land) Many people know this country as Siam, the name it used to have. Its present name, Thailand, means "land of the Thai people."

Thailand is one of the small countries—it is about three-fourths the size of Texas—that together fill the big peninsula in south-eastern Asia. The whole peninsula is near enough the equator to be warm all year round. Summers are hot and in most places very rainy.

The land of the Siamese, or Thais, has been a free kingdom for more than 600 years. The other countries of the peninsula were ruled for many years by either

Britain or France and won their freedom rather recently.

Over half of Thailand is covered with forests. In the forests are many teak trees. Teak is much used for furniture. A third of the people live in the central plain, through which Thailand's one big river flows. This river is an important waterway. On it, near the Gulf of Siam, is Bangkok, a city of over 2,000,000.

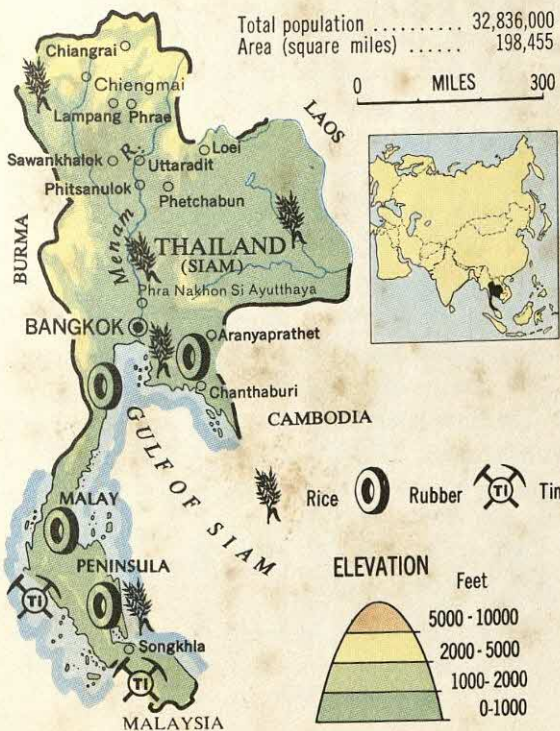
In the forests, elephants help pull logs to the river. Thailand has 11,000 tame elephants. The river brings big rafts of teak logs to Bangkok's sawmills. Boatloads of rice come down the river, too.

About three-fourths of all the people of Thailand are farmers or fishermen. Rice and fish are the chief Thai foods. Thailand is not only one of the world's great rice producers but also a great rice exporter. Rice is so important to Thailand that a colorful religious ceremony is held each year at rice-planting time. Millions of water buffaloes help in the rice fields.

Corn, sugarcane, manioc, and jute are other crops of this tropical land. Much rubber is produced.

Thailand is rich in minerals. Its tin and tungsten are the most important.

Bangkok is the country's capital. A century ago all the streets of the city were canals. Some are still canals, but there are paved streets, too, and many automobiles. Visitors from other lands come by rail, plane, or ship. They see new Western-style buildings; they see, too, beautiful pagodas and palaces that show Bangkok is a city of the Far East. (See ASIA; BURMA.)



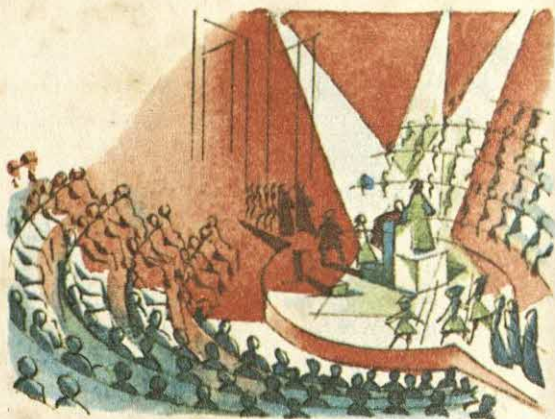
THANKSGIVING The Pilgrims reached Plymouth in December of 1620. Their first winter was long and cold. Food was scarce. There was much sickness. No one knew whether the Indians would stay friendly. But after spring came, everything was more promising. From the Indians the Pilgrims learned how to raise corn. The crops of corn and vegetables were good. At harvest-time Governor William Bradford, the head of the colony, called on his people to come together and give thanks to God for the good harvest. This was the first Thanksgiving celebration in America. The celebration lasted three days. Massasoit, an Indian chief-tain, and many of his tribesmen were guests. As a gift to the Pilgrims they brought five deer they had killed.

The idea of a thanksgiving celebration was not new. Even in ancient times days had been set aside for giving thanks. The Pilgrims' first Thanksgiving, moreover, was not the beginning of the regular yearly holiday we have now. Thanksgiving became a regular national holiday while Abraham Lincoln was president of the United States. In 1863 Mrs. Sarah J. Hale, who was the editor of *Godey's Lady's Book*, asked Lincoln to set aside a day for giving thanks. He did so. Ever since that time there has been a Thanksgiving Day each year.

For many years Thanksgiving Day was always the last Thursday in November. As a rule November has four Thursdays, but it may have five. If so, the last Thursday is very close to the end of the month. In some years, therefore, the time between Thanksgiving and Christmas was very short. Some people objected to having two big holidays so close together. In 1939, 1940, and 1941 Franklin D. Roosevelt moved Thanksgiving Day back a week to give more time between the two holidays. But many people objected. In some states the people celebrated the last Thursday as usual. In other states the people celebrated "Roosevelt's Thanksgiving." To settle the matter, Congress passed a law in 1941 saying that after that year

Thanksgiving would be the fourth Thursday in November.

There are special ways of celebrating each of our national holidays. Having a big dinner with roast turkey, cranberry sauce, and pumpkin pie is one way of celebrating Thanksgiving. Going to visit relatives is another. And churches, as a rule, have special services for saying thanks—for carrying out the real purpose of the holiday. (See **HOLIDAYS**; **PILGRIMS**.)



Modern Theater-in-the-Round

THEATER One way of telling a story is to act it out. An acted-out story is called a play. The actors in a play usually speak, too, as they act their parts. Plays as a rule are given in theaters.

The first theaters we know about were built by the ancient Greeks. Their theaters were not much like ours. They were all outdoors. The seats were on a sloping hillside. The stage was a circle of grass.

At first the Greek theaters were not used for plays. They were used for songs and dances in honor of the Greek gods. The songs were sung by a chorus. These songs told stories of the gods.

In time members of the chorus acted out the stories. This was the beginning of real plays. Later, Greek writers such as Aeschylus, Sophocles, Euripides, and Aristophanes wrote some of the best plays that have ever been written.

Even after real plays were being given, the Greek theaters were still outdoors.

There were no curtains. There were no footlights. There was almost no scenery except a background. But there were a few stage machines. One was for making thunder. The actors—they were all men—in ancient Greek plays always wore masks.

The Romans borrowed the ideas for their theater from the Greeks. But they built big theaters on level land. Each row of seats was raised above the row in front so that everyone could see. Roman writers wrote many plays. The Romans, however, came to like chariot races and fights between men and wild animals better than plays. For centuries after the fall of Rome there were almost no plays and no actors in Europe. All this while there were plays and actors in China and India. But those lands were far from Europe.

During the Middle Ages the people of Europe became interested in acting again. Plays somewhat like present-day pageants were given in churches or courtyards.

Not until the time of Shakespeare did plays and theaters come to be anything like

ours. Even in Shakespeare's time no women acted in plays. Women's parts were taken by boys. Many of the modern ideas of plays and of acting developed in Italy, France, and England and spread from there.

In various places small movable theaters became popular. There were showboats on rivers and caravan shows on land. In some movable theaters the actors were puppets.

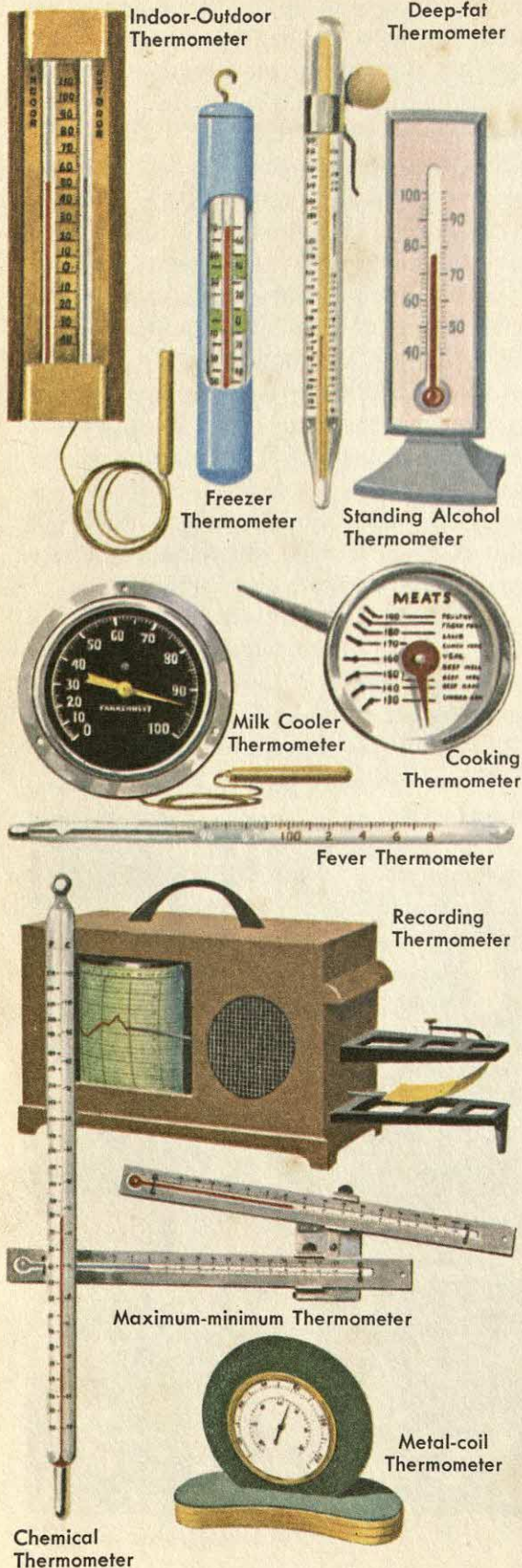
Today much acting is done in front of a camera instead of an audience. Many of today's theaters are motion-picture theaters, and many actors appear on television.

A really great actor makes us forget who he is during a play. We think only of the part he is taking. He makes us not only see what the character in the play is doing but also understand what the character is supposed to be thinking and feeling.

Today we consider acting an art. We honor great actors just as we do great painters, sculptors, musicians, architects, and other artists. (See ENGLISH WRITERS; LITERATURE; MASK; MASQUE; PUPPETS; SHAKESPEARE, WILLIAM.)

TYPES OF THEATERS





THERMOMETER A cricket chirps faster when the weather is warm than when it is cold. But none of us keeps a pet cricket to tell us how warm or cold it is. We use thermometers instead.

Many of our thermometers are alcohol thermometers. The alcohol in them is colored either red or blue so that it can be seen easily. In an alcohol thermometer there is a glass tube that has a bulb at one end. The other end is closed. The bulb is full of the colored alcohol. The tube, too, is partly full.

An alcohol thermometer works in this way: When the alcohol is warmed, it gets bigger. We say that it expands. It gets smaller when it is cooled. We say that it contracts. When the alcohol in the thermometer expands, it rises in the tube. There is no other place for it to go. When the alcohol contracts, it falls lower in the tube. We can tell the temperature by seeing how high the alcohol is standing.

Alcohol thermometers can be used to measure very low temperatures. Alcohol does not freeze until it gets very, very cold. One part of a maximum-minimum thermometer shows the lowest temperature reached during a day. It is an alcohol thermometer. Alcohol thermometers cannot measure high temperatures. Alcohol boils at a temperature that is not very high.

Some thermometers are made with mercury instead of alcohol. Mercury expands when it is heated and contracts when it is cooled, just as alcohol does.

Mercury does not boil until it is very hot. But it freezes rather easily. Mercury thermometers, then, can be used to measure high temperatures but not low ones.

A clinical, or fever, thermometer is a special kind of mercury thermometer. There is a pinched-in place in the tube to keep the mercury from falling back into the bulb until someone shakes it down. Because the mercury stays up in the tube, a doctor can read a fever thermometer after he takes it out of his patient's mouth. One part of a

maximum-minimum thermometer shows the highest temperature reached in a day. It is much like a fever thermometer.

Some thermometers are made with metal coils. When the temperature goes up, the coil winds tighter. It unwinds when the temperature goes down. A hand fastened to one end of the coil moves over a dial and tells what the temperature is.

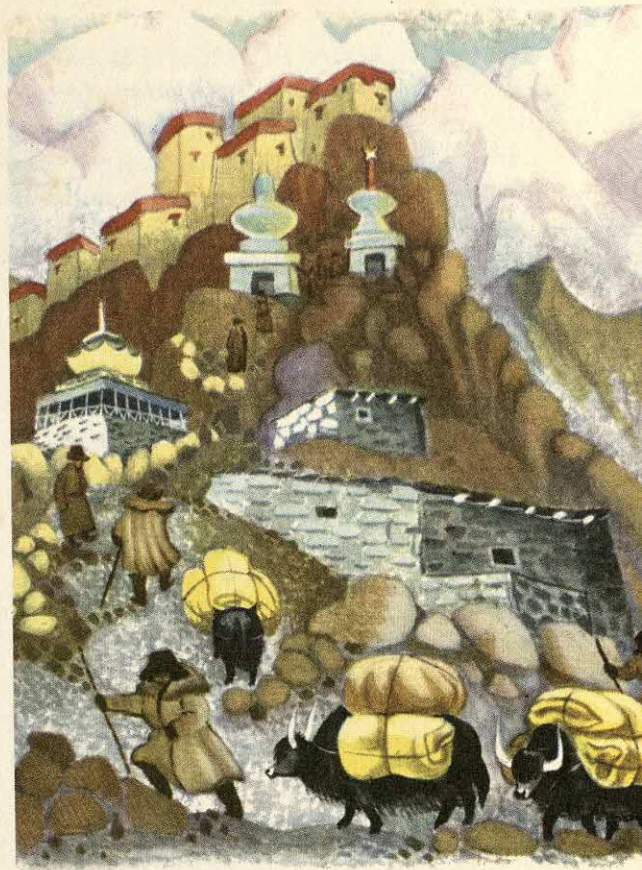
Some metal thermometers keep a record of the temperature. There is a pen at the end of the hand. This pen makes a mark on a special sheet of paper that is moved by clockwork.

Temperature is measured in degrees. But a degree on one thermometer may not mean the same as a degré on another. Most of the thermometers in the United States are marked with the Fahrenheit scale. On this scale the freezing point of water is 32 degrees. The boiling point is 212 degrees. Most scientists use thermometers marked with the Celsius, or centigrade, scale. On this scale freezing point is 0 degrees and boiling point is 100 degrees.

The normal temperature of the average person is 98.6 degrees Fahrenheit (98.6° F.). This temperature is the same as 37 degrees centigrade (37° C.).

The first thermometer was made about 375 years ago. The famous Italian scientist Galileo made it. His was an air thermometer. Air expands and contracts just as alcohol and mercury do.

We need thermometers for many things besides telling what the temperature of the air is and whether we have a fever. Bakers and dairymen need them. So do ice-cream makers. Thermometers help in the making of brick, steel, glass, china, plastics, and many other things besides. In thermostats they help keep our homes and other buildings the right temperatures. Scientists need thermometers, often of such special kinds as those used in space probes, in many of their studies. We could not get along easily without thermometers. (See HEAT; U.S. WEATHER BUREAU.)



Yak Caravan in Tibet

TIBET This high land of central Asia is now part of China. Tibet is often called the "roof of the world." The highest of all plateaus makes up most of it, and on its southern edge are the Himalayas. Nearly all the great rivers of Asia rise in Tibet.

It is hard for Tibetans to earn a living. Many of them are nomads. Some farm, but only a few small valleys are suitable for crops. Grasslands furnish sheep and cattle with pasture. The yak is the work animal. Motor roads now cross Tibet and half a million Chinese live there.

The capital, Lhasa, used to be called the Forbidden City, for few visitors were welcome. Tibet was long ruled by the Dalai Lama, the head of its state religion, Lamaism. In 1959, after a revolt against China failed, the Dalai Lama fled to India.

The Chinese are finding Tibet a great storehouse of minerals, among them coal, iron, lead, zinc, oil shale, and gold. (See HIMALAYAS; YAK.)

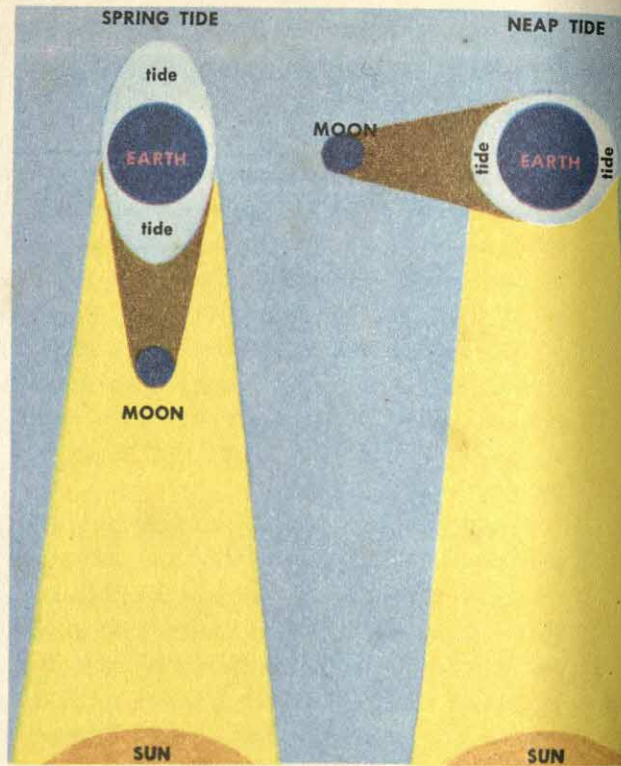
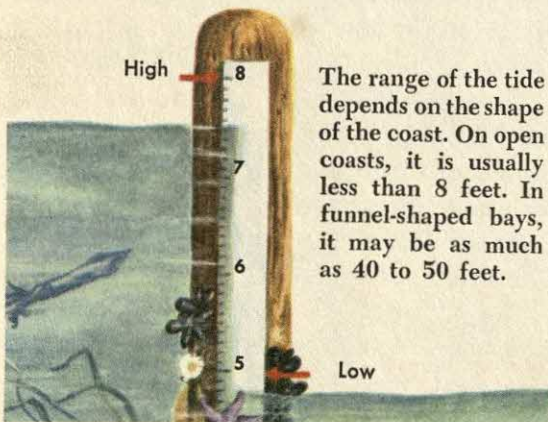
TIDES The water of the sea is always moving in or out along the shores. We call this movement of water the tides.

When the water is at its highest, we say that there is high tide. When it is at its lowest, we have low tide. It is usually a little more than six hours from high tide to low tide. Then it is a little more than six hours till high tide again. In most cases two high tides and two low tides take a little more than a day.

The moon causes the tides. As the earth turns, the moon pulls up the water on the part of the earth that is turned toward it. At the same time, the water on the other side of the earth bulges out away from the moon. The moon is really pulling the solid part of the earth away from the water there. High tide occurs on opposite sides of the earth at the same time.

Sometimes the earth, sun, and moon are in a straight line. Then the sun pulls with the moon, and the tides are higher than usual. They are called spring tides. Neap tides are the opposite of spring tides; the sun is not pulling with the moon.

Tides are important to sailors and fishermen and to people who live along the seashore. Big ships can enter and leave some ports only when the tide is high. On the other hand, diggers can dig for clams only when the tide is low. The tides turn the generators of some electric power plants. Besides, they scour the seashores and help make them pleasant places. (See MOON.)



The pull of the sun affects the tides.

TIGER The tiger is one of the biggest of the "big cats." The largest are larger than the largest lions. Lions are powerful, but many people think tigers are even stronger. In the few recorded fights between lions and tigers the tigers won.

Tigers are found wild only in Asia and nearby islands. Most tigers are found in the jungles of the south, but some tigers live in the northern, cooler parts of Asia. The tigers of the north are very much like those of the south except that they are bigger and have longer, thicker fur.

Normally tigers are striped. Their stripes help them hide in tall grass or among small trees. But in India there are some white, or albino, tigers.

Like all the other cats, tigers are meat eaters. Deer, antelopes, monkeys, tapirs, and even crocodiles are among the animals they eat. A grown-up tiger needs about 6,000 pounds of meat a year. As a rule, unless food is scarce, tigers do not eat people. Some, however, become man-eaters when they get old and less able to hunt.

Although tigers are found wild only in Asia, they are common animals in zoos in most parts of the world. They are common in circus menageries, too. Tigers stand captivity well. The tiger in the zoo is a real aristocrat. It does not perform antics to attract attention as monkeys do. A tiger does not beg for food like bears and elephants. And it does not stand about looking stupid like a hippopotamus.

Tiger babies stay with their mother for a year or so. In zoos everyone likes to watch the baby tigers. They are as playful as pet kittens. (See CARNIVOROUS ANIMALS; CATS; CIRCUS; ZOOS.)



Tiger

TIMBERLINE Many mountains have forests clear to their tops. But on many others there is a line above which trees will not grow. This line is called the tree line or the timberline.

Just below the tree line the trees are likely to be twisted out of shape. They are likely to be dwarfed, too. They are twisted and dwarfed by the strong winds that blow around mountaintops.

Trees do not grow above the timberline, because they cannot get enough water above that level. The cold of the mountaintops keeps the water in the ground frozen for a large part of the year. The tops of many mountains are cold deserts.

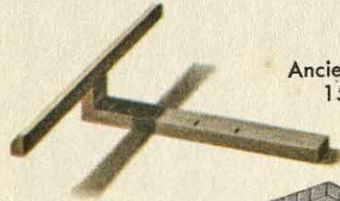
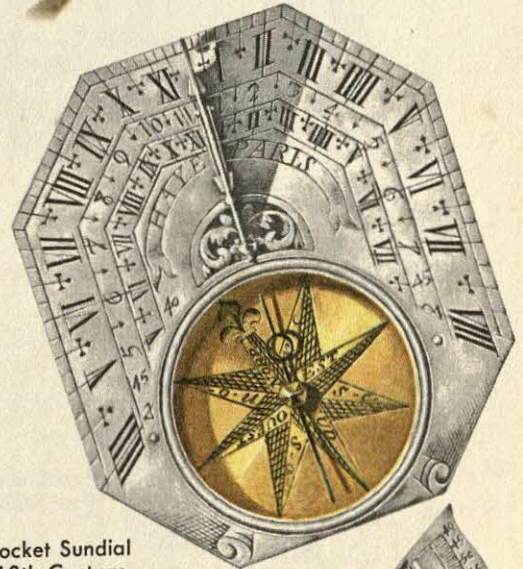
The timberline is much higher on some mountains than on others. For example, trees grow several thousand feet higher in the Himalayas, which are on the edge of the tropics, than in the Alps or the Canadian Rockies, which are much farther north.

TIME AND TIME TELLING An early caveman would not have had any use for an electric clock even if he could have had one. His life was very simple. He got up when the sun rose and went to bed at dark. He ate whenever he could find food. He did not care at all about telling the time of day.

But when people began living together in groups, they needed some way of telling time. We can guess what the earliest ways of telling time were by finding out how primitive peoples tell time now.

Some primitive peoples tell time by the sun. When one plans to meet another he may point to a place in the sky and say, "I will meet you when the sun is there."

Primitive peoples also tell time by shadows. In the language of one group the word for afternoon means "the shadow is turned around." Many trees and cliffs, by casting shadows, serve as timepieces.

Ancient Egyptian Sundial
15th Century B.C.Pocket Sundial
18th CenturyGnomon, or Shadow-casting
Part, of Above Sundial

The first timepiece anyone made was a sundial. A sundial tells time by shadows. The first sundial was probably nothing but a stick stood up in the ground in some open space. Perhaps a stone was placed so that the shadow of the stick would strike it when the sun was highest in the sky.

The oldest sundial known was made in Egypt about 3,500 years ago. As its picture on page 1353 shows, it was very simple. The Greeks were the first people to use sundials a great deal. They made very

good ones. The eight-sided Tower of the Winds still stands among the ruins of ancient Athens. On each of its eight sides there was once a sundial.

Sundials, when they were first taken to ancient Rome, were not popular. The Romans did not want a "cold stone" to tell them when it was time to eat their meals. They wanted to eat whenever they happened to feel hungry.

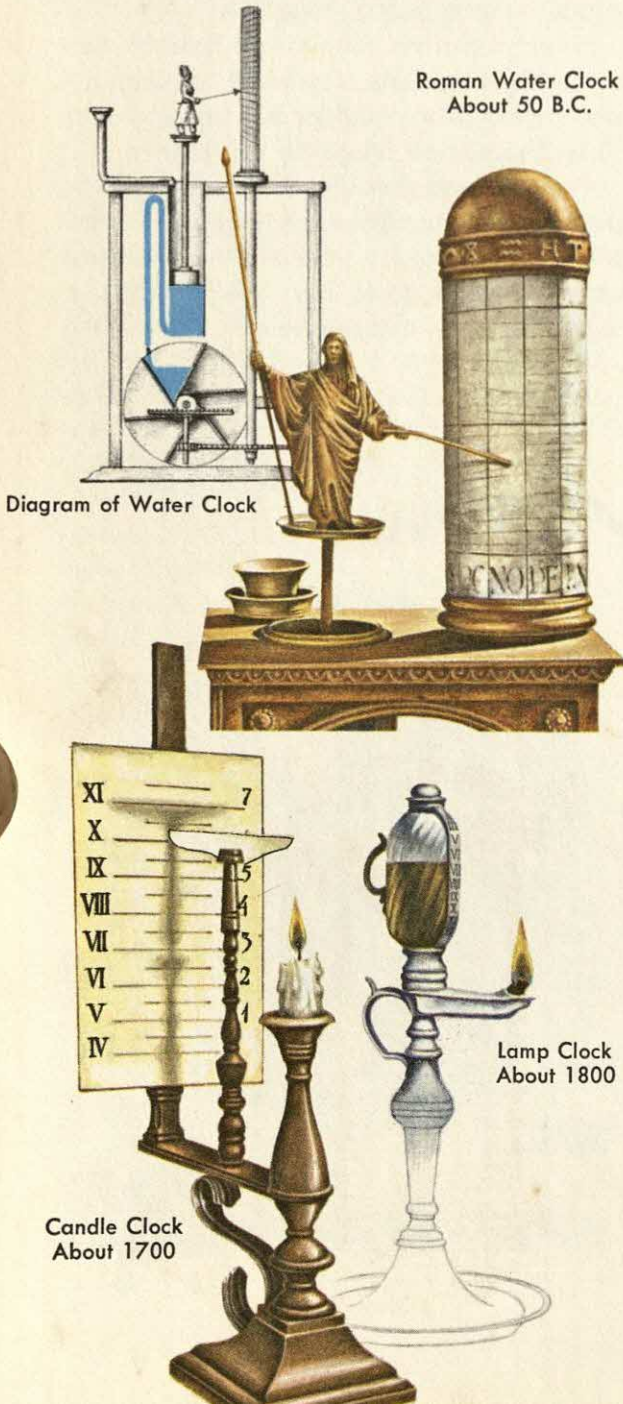
On the early sundials there were not many marks. On some of them the day was divided into just four parts. But by 2,000 years ago it was a common practice to divide the time between sunrise and sunset into 12 equal parts, or hours. Since days are longer in summer than in winter, summer hours were longer than winter hours.

No one is sure why 12 was chosen as the number of hours for the day. Hours are not marked by nature. The day could just as well have been divided into 10 or 20 or any other number of hours. Later the night was divided into 12 hours, too.

Sundials were the chief timepieces for hundreds of years. Even after watches were invented many people wore their watches as ornaments and carried little sundials with them to tell the time. Today we often find sundials in gardens.

A sundial cannot tell time at night, when the sun is not shining. It cannot tell time on days when the sun is hidden by clouds. And it cannot tell time to the second. It is no wonder that people worked out other ways of telling time.

The water clock was invented almost as long ago as the sundial. Water clocks were much used in Greece more than 2,000 years ago. There were many orators in Greece in those days, and water clocks were used to time their speeches. One kind of water clock was a metal bottle with a hole in the bottom. The bottle was filled with water, and the water dripped through the hole. An orator might be told that he must stop talking when the water had run out. Another kind was a floating bowl with a



hole in the bottom. The bowl gradually filled with water and at last sank.

Some water clocks had dials that could tell the time of day. The Tower of the Winds not only had eight sundials on its outer walls but also had a big water clock of this kind inside.

The diagram beside it shows how the Roman water clock pictured worked. The figure sank as water flowed out from beneath it. The hours were marked on the drum the pointer moved down.

One of the most elaborate water clocks ever made was given to the great emperor Charlemagne nearly 1,200 years ago. The famous ruler of Baghdad, Harun al-Rashid, sent it to him. This clock was made of bronze inlaid with gold. The dial had 12 small doors to stand for the hours. The doors opened as the hours passed. As each door opened, one or more little brass balls dropped on a brass drum. The number of balls told the hour.

Water clocks could tell time day or night. But they often went wrong. Sometimes, for instance, the water froze. Besides, even the best water clock could not measure time in minutes and seconds.

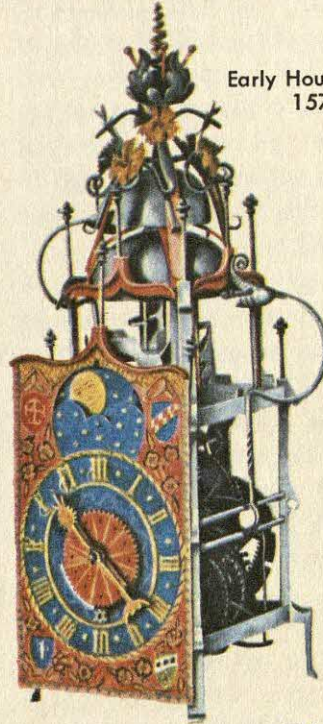
The sandglass is another timepiece that was invented long ago. No one knows how long ago. We do know the ancient Egyptians had sandglasses. Sandglasses were often called hourglasses because in many of them it took an hour for the sand to run from one half to the other. Sandglasses were much like the first water clocks. But they never developed into clocks that could tell the time of day. We still, however, often use little sandglasses to time telephone calls or the cooking of eggs.

In early days fire also was used to measure time. Striped candles and candle and oil-lamp clocks, for instance, measured time by burning.

Of course, a very important part of the history of time telling is the story of clocks and watches. That story goes all the way from the clocks of centuries ago that merely

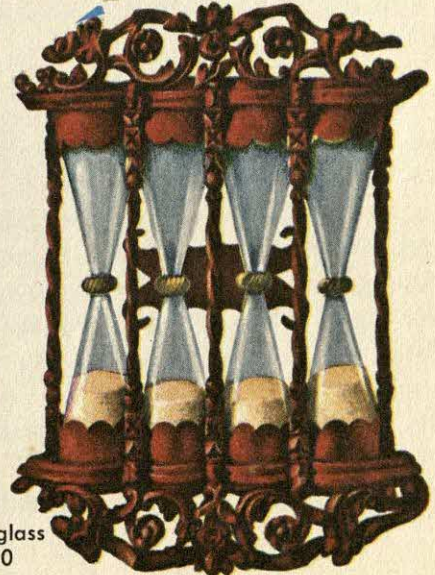
struck the hours and the watches that were "ticking toys" to the atomic clocks of today that will not lose or gain as much as a second in 30,000 years.

Today hours are the same length day and night, summer and winter. Each hour is divided into 60 minutes and each minute into 60 seconds. We have 60 seconds and 60 minutes because 60 was very important in the number system of the people who lived in ancient Babylonia, a land from which many of our ideas came.



Early House Clock
1570

German Table Clock
About 1600



Quartet Sandglass
About 1550

One thing about telling time is always rather puzzling. When it is noon in Chicago, let us say, it is six o'clock in the evening in London and only ten o'clock in the morning in San Francisco. We can understand why the time is not the same all over the world if we think of telling time from sundials. The shadow falls on the noon mark of a sundial when the sun is highest in the sky for the day. When it is noon in Chicago it is noon everywhere straight north and straight south of Chicago. But nowhere else does the shadow fall on the noon mark at this moment. In New York and other places to the east the shadow has passed the noon mark. It is afternoon in those places. In San Francisco and other places to the west of Chicago the sun is not yet high enough in the sky to make the shadow fall on the noon mark. It is still morning there.

A difference of only a few miles east or west makes a difference of a minute in sun time. But when a person goes on a journey he does not want to change his watch every few miles. For this reason the world has been divided into time zones. All the places in each zone have the same time. It is called standard time. Some artificial satellites help the different parts of the world check their clocks.

In summer most of the 50 states have daylight saving time. It gives people more hours of daylight after work. (See **CAL-NDAR; CLOCKS AND WATCHES; INTERNATIONAL DATE LINE.**)

TIN People have used tin for a very long time. More than 2,500 years ago the Phoenicians were sailing all the way from their home at the eastern end of the Mediterranean Sea to the British Isles to get tin. And people had used tin long before that. At least 5,000 years ago our ancestors were making tools and weapons of bronze, which is a mixture of copper and tin.

Tin is not found free. It must be taken from some kind of ore. The chief tin ore is called tinstone. Lumps of tinstone are found

in the gravel in streams in some parts of the world. The ore is also found in streaks, called veins, in some rock.

Tin is a soft metal. It does not rust. For this reason it is often used to coat iron.

The United States has almost no tin. But this country uses a large part of all the tin produced in the rest of the world. The big producers are Malaysia, Bolivia, Indonesia, Thailand, China, and Nigeria.

A great deal of the tin brought into the United States goes into the making of tin cans. A tin can is an iron can coated with tin. A can of pure tin would be too soft to use. But pure tin is very good for collapsible tubes for such things as ointments and artists' paints.

Bronze is not the only mixture, or alloy, of tin. Most pewter is a mixture of tin and lead. Another mixture of tin and lead is solder. Type metal is made of tin, lead, and antimony.

Most people do not realize how important tin is in their lives, for the tin in use is usually well hidden. In an automobile, for instance, tin is hidden in dozens of places—the soldered joinings, the metal of the engine block and the bearings, and the radio's wires for a few. No wonder the United States is a big user of tin. (See **AL-LOYS; BRONZE; ELEMENTS.**)

TIN ORE (CASSITERITE, OR TINSTONE)



USES OF TIN

TITANIUM This strong, lightweight metal is just coming into its own. Titanium was not discovered until 1791. It is never found free, and in its compounds it is well hidden. Even after it was discovered, titanium was not used for a long time. Until late in the 1940's there was no good way of getting it out of its ores.

Titanium can stand salt water and sea air almost as well as the very expensive metal platinum. Most acids have no effect on it. It can stand great heat, too.

The chief use of titanium is in alloys for building airplanes and rockets. Another important use is in pigments. Titanium dioxide, a compound of titanium, is very,



Reed Boats on Lake Titicaca

the summer its water is much colder than the water of these North American lakes. Its water is cold because Lake Titicaca is high above the sea and is more than 1,000 feet deep.

The region around the lake is arid. No trees grow nearby. The farmers and fishermen on its shores have had to find something besides wood to make boats of. They have found they can make sturdy boats of the reeds that grow at the edge of the lake. These reed boats are called balsas.

Near one end of Lake Titicaca there are ruins left by highly civilized Indians who lived there centuries ago and were in time conquered by the Incas. The Aymara Indians of the region today are their descendants. Around the lake and on the Island of the Sun and Island of the Moon there are Inca ruins, too. (See INCAS; LAKES.)



very white—whiter than snow. It is used in paint, china, paper, cosmetics, and the rubber for white-walled tires.

The ore rutile consists mainly of titanium dioxide. Man-made rutile crystals are used as gems. They are more brilliant than diamonds. Another titanium compound is used in smoke screens. (See ELEMENTS.)

TITICACA, LAKE Of the freshwater lakes in South America, Lake Titicaca is the largest. It is, besides, the highest big lake in the world.

The lake is on a high plateau in the Andes. It is nearly two and a half miles above the sea. Part of the lake is in the country of Bolivia. The rest is in Peru.

This big lake is much nearer the equator than the Great Lakes are. But during

TOADS AND FROGS A mother bullfrog lays her eggs in the water of a pond. They are surrounded by transparent jelly. The eggs hatch into tiny tadpoles which breathe with gills and have long tails. The tadpoles eat plants that grow in the water.

As a bullfrog tadpole grows, first two hind legs and then two front legs appear. After a time its tail starts getting shorter. It shrinks just as a camel's hump shrinks when the camel is using up the fat stored there. The tadpole loses its gills and gets lungs instead. A tongue grows in its mouth. The tadpole is now ready to eat insects instead of plants. At last its tail is gone. The

bullfrog is now adult; it has become an air-breathing land animal.

The story of most of the hundreds of kinds of frogs and toads is much like the story of the bullfrog. So is the story of most amphibians—the big group of animals to which toads and frogs belong. “Amphibian” means “living a double life”—a life in water and a life on land.

Toads and frogs are sometimes called the tailless amphibians. Their lack of tail when they grow up makes them different and easy to tell from their amphibian cousins, the salamanders and caecilians.

But there is no way of telling, in a great many cases, whether a tailless amphibian should be called a toad or a frog. Many of these animals, in fact, have both a frog and a toad name. The little tree frog, for example, is also called the tree toad. “Frog” and “toad” have separate meanings only when they are used for members of two big families of the group—the true frogs and the true toads. These frogs and toads are usually easy to tell apart.

A tree frog can change from green to gray or brown.



True frogs have smooth, moist skins. True toads have dry skins covered with little bumps, or warts. Frogs are slender and graceful. Toads are broad and, with their short legs, clumsy looking. Frogs have more conspicuous eardrums. Toads have big poison glands back of their eyes.

Toads and frogs do us no harm. The idea that handling a toad causes warts is just a superstition. Some toads and frogs are very helpful. Tadpoles help keep fishbowls and garden pools clean. Grown-up toads and frogs eat many harmful insects. A toad may eat 50 army worms at a single meal! And many people think frogs' legs are very good food. (See AMPHIBIANS.)

Common Toad



Vocal sacs make the croaking of frogs and toads louder.



The tongues of frogs and toads are attached at the front of the mouth.



Bullfrog Tadpole



Green Frog



Bullfrog

TOBACCO The nightshade family is one of the very important families of flowering plants. It gives us a common garden flower, the petunia. It gives us some of our vegetables, too—the potato, tomato, eggplant, and pepper. It also gives us the tobacco plant, often called “the weed.”

Tobacco is an American plant. No one from other lands had ever seen tobacco until the early explorers found the Indians smoking it. Now it is one of the world's leading crops. The United States produces more than two billion pounds of tobacco every year.

Tobacco is made into cigars, cigarettes, pipe tobacco, and snuff. Very little now goes into snuff. But 200 years ago every fashionable gentleman in America and in much of Europe carried his snuffbox. Today the cigarettes smoked in the United States in one day would more than reach around the world if they were laid end to end.

All the tobacco products are made from the leaves of the tobacco plant. The leaves may be more than a yard long.

Tobacco seeds are tiny and black. They are planted early in the spring in well-protected seedbeds. The plants are transplanted to fields when they are several inches tall. The tops of the plants are cut off at flowering time to make the leaves grow large. In some places the tobacco fields are covered with cheesecloth tents or with slats for shade. The leaves on the plants raised in these fields are thin and tender. They are used as the outside wrappings for fine cigars.

After tobacco leaves are cut, they are hung up, usually in a tobacco barn, to be cured. Most tobacco barns do not look like

barns for cows or horses; they are much more open. The openings are for air to enter. As a rule, heat from a fire in the barn or in a lean-to is used to help with the curing. After tobacco is cured, it is packed in big casks called hogsheads to age.

Tobacco has nicotine and tars in it. Many doctors urge their patients not to use tobacco because of diseases these substances may cause. Studies that have been made indicate that using tobacco—cigarettes in particular—is a health hazard.

Early settlers along the James River in Virginia found the land there good for raising tobacco. Tobacco was in great demand in Europe. Sir Walter Raleigh had helped make its use popular in England. With the tobacco they raised and shipped away, the settlers could pay for goods they needed. The story of the 13 colonies might have been very different if it had not been for tobacco. (See FLOWER FAMILIES.)



Indian with Pipe,
or Calumet

Elizabeth I
and Raleigh



TOKYO The city of Tokyo has more people than any other city in the world today except Shanghai. It is on Tokyo Bay, on the eastern coast of the Japanese island of Honshu. Tokyo began in the 1100's as a small village called Edo. It had grown to be a city of over a million and a half people when the emperor of Japan moved his capital there in 1868. Its name was then changed to Tokyo—"eastern capital."

The world was shocked in 1923 to hear that half of Tokyo had been destroyed by earthquake and fire. Immediately the people of Tokyo carefully planned the rebuilding of the ruined areas. In the central district they put up modern office buildings, banks, stores, and hotels. They built them of steel and concrete to withstand earthquakes and fire. They made wide streets to serve as firebreaks and to carry streetcars, buses, and automobiles. Traffic moves along the left side of the streets as in England. Much of the city had to be rebuilt again after the bombings of World War II.

A large part of the city outside the business district is a network of narrow, crowded streets and canals. Many houses are of unpainted wood. A family may have a little factory or store under the same roof with its home. This part of the city is oriental Tokyo. As one might expect, thousands and thousands of people now live in Tokyo suburbs. Freeways, subways, and railways lead into and out of the city.



Many of the people of Tokyo are busy with work in government and education. The emperor lives in the city in a palace surrounded by beautiful grounds. The Diet, or congress, meets in Tokyo. There are many universities among its schools. The city has fine art museums and theaters.

Tokyo is in a good position for carrying on manufacturing and trade. It is on the coastal edge of the largest lowland of Japan. This lowland is thickly settled with farm villages and towns. It furnishes both workers and customers for Tokyo factories. Lowland farms furnish much food for the city dwellers. The power for the mills comes from hydroelectric plants in the nearby well-watered mountains. Tokyo has important shipbuilding yards, automobile factories, and textile mills.

Tokyo docks once received only small vessels carrying on coastwise trade, for the city is on the shallow part of the bay. Yokohama, on the deeper part, served as its port. But much dredging has been done to deepen the harbor at Tokyo. Now ocean-going boats can reach its docks. The Yokohama-Tokyo route across the Pacific to Seattle, U.S.A., is one of the world's great ocean highways. Tokyo is an airline center, too. It is an important stepping-stone for flights between continental Asia and western North America. Its international airport is one of the world's busiest. (See CITIES; JAPAN; OSAKA.)

TOOLS People are far ahead of their animal relatives partly because they have better brains and partly because they have good hands. One way their brains have helped them is that they have been able to plan tools. One way their hands have helped them is that with their hands they have been able to make and put to use the tools they planned.

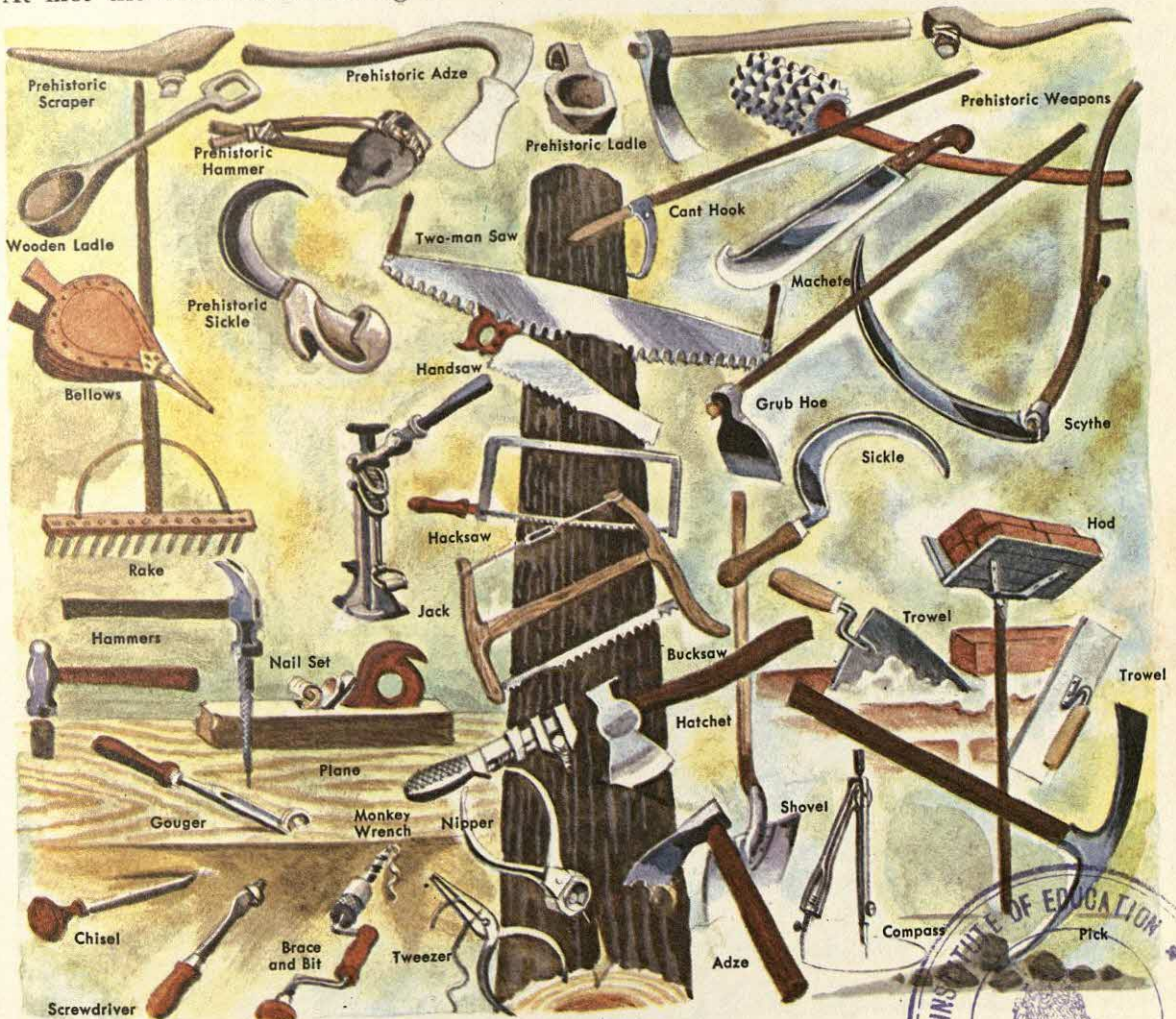
The story of Robinson Crusoe tells that Crusoe, after his ship was wrecked, built a raft and went back to the ship to rescue what he could before it sank. The very first thing he hunted for was a tool chest. He knew that he needed tools more than anything else on the ship. The story reminds us that tools are important in our lives.

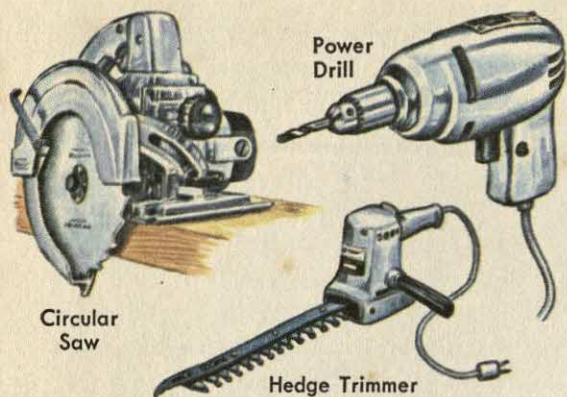
All the earliest tools were made of stone. At first the tools were nothing but stones

that happened to be well shaped for scraping or chopping. Then our early ancestors learned to shape better tools of stone. They learned to fasten handles to some of them with strips of skin. A few early stone tools are shown in the picture.

In time copper and bronze took the place of stone in tools. Then came iron. Iron was of the greatest importance in the development of tools. Most of our modern hand tools can be traced back to the early days of iron. Among the new tools that appeared were hinged tongs, hacksaws, files that could file metal, and anvils for making nails. Steel followed iron. Most tools of today are made of steel.

In the picture there are about 30 of the tools people use today. From their looks and names it is rather easy to tell





TOTEM POLE The people of many primitive groups think that their lives are tied up in some magical way with some animal. They may think that the animal is their ancestor. They may think that the animal is the guardian of the group. This animal is the group's totem.

Although the idea of totems is common, totem poles like those in the picture all came from the same part of the world. They were made by tribes of Indians living along the coast of northwestern North America. These Indians were divided into clans. One, for instance, was the Raven clan. Among others were the Bears, the Eagles, and the Wolves. The clans were divided into smaller groups. Each had its totem.

The Indians lived in log buildings. Several families lived together in each house. The custom grew up of carving all the totems connected with a household on a tall pole nearby. A totem pole was a little like a combination storybook and directory.

The totem poles often were beautifully carved and painted. Many of those made a century or so ago may now be seen in parks and museums. Today the art of carving totem poles has been revived among some of the Northwest Coast tribes. (See INDIANS, AMERICAN; MASK.)

what most of them are for. Probably you have used many of them.

The tools pictured on page 1361 are all hand tools. There are also many power tools. These tools are usually run by electric motors. They do work much faster than it can be done with hand tools.

Tools are needed for many kinds of work. Carpenters and furniture makers, for instance, could not get along without them. Neither could machinists. Stonecutters, bricklayers, and plasterers are among the other workmen that need tools. But many people work with tools just for fun. Do-it-yourself tool kits are sold in great numbers. Using them has become a popular hobby. (See BRONZE; HOBBIES; IRON AND STEEL; MACHINES, SIMPLE.)



TOYS Children have had toys to play with for thousands of years. Perhaps even the children of the cavemen had toy spears to use in make-believe hunting. We are sure that Egyptian and Babylonian children had toys several thousand years ago. In museums there are rattles, dolls, balls, toy animals, and toy wagons left over from those times. These toys were found in the ruins of ancient villages and cities. There are a few mechanical toys—toys that work—left from ancient times, too.

Of course, the children of thousands of years ago had no electric trains, dolls with nylon hair, rubber balls, or plastic building blocks. No one knew about electricity then, and there was no rubber or nylon or plastic. Most of the toys were made of baked clay, bronze, or wood.

Germany has long been famous for its toys. Germany has many trees, and its early toys were made mostly of wood. The people of whole villages made toys. The toys were, as a rule, carved by hand. Many toys are still made in Germany, but today most of the toys sold in America are made in America. The United States has become one of the chief toymaking countries.

A visit to a big toy department today is exciting. There are sure to be toys of many different kinds. Among them are toys to pull and toys to pound, dolls and doll-houses, musical tops and little pianos that play, floating toys, toys run by electricity, wagons, scooters, and bikes, swings and slides, and balls and bats. There are sure to be, too, building sets—wooden blocks, plastic blocks, and sets made of steel. Almost every machine that grown-ups use is there in toy size—steam engines, electric motors, printing presses, tractors, typewriters, and automobiles, airplanes, and rockets. There are even toys controlled by radio waves. The list could go on and on.

Some grown-ups think that buying toys is a waste of money and that playing with toys is a waste of time. This idea is wrong. Playthings are more than just fun. Good

Greek
About 1500 B.C.



toys help children learn to use their hands skillfully. Playing with some toys teaches them about science, literature, history, and other subjects. Above all, playing with toys gives children a chance to use their imaginations. (See DOLLS; GAMES AND SPORTS; MARBLES.)

TRADE A caveman, let us suppose, had two good spearheads. But he had no good knife. A neighboring caveman had two good knives, but no good spearhead. The one with two good spearheads offered the other a spearhead in exchange for a knife. The deal was made, and each caveman was better off than he had been before.

In some such way as this trade began. And even today the idea underlying trading is the same. A person gives up something he has for something he wants more.

No one knows exactly when and where the first trading was done. We do know that when written history began a great deal of trading was going on.

One trouble with simple trading is that a man with more of something than he needs may not live near anyone who wants it. Or he may not want anything others near him

have to give in exchange. It is understandable, then, how thousands of years ago there came to be merchants. A man with more baskets than he wanted could take them to a merchant. Someone else might bring cloth or wheat to the merchant. Anyone who brought in things to trade could take in trade other goods the merchant had. The merchant was an in-between man, or middleman.

Trading one kind of goods for another is called barter. Barter still goes on today. But centuries ago trading was given an enormous boost by the invention of money.

Many early merchants traveled from place to place. Their travels let people trade with others many miles away. Traveling merchants are called peddlers. Peddlers were very important in early times and up through the Middle Ages. They were still very important during the early days of America.

Even in the days of the ancient Egyptians merchants were going from one country to another. During the Middle

Ages there came to be great trade routes between countries of Europe and Asia. Many voyages of discovery were really trading ventures.

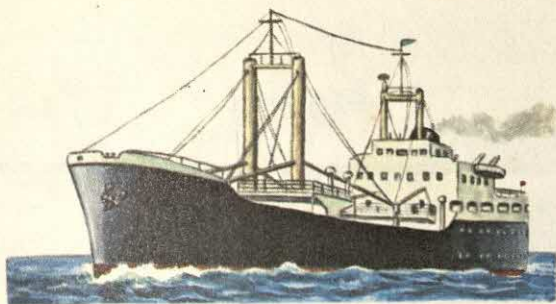
We are now so in the habit of going into a store and getting what we want that we think very little of the amount of trading that is back of the goods that are offered for sale. Such a simple thing as a lead pencil is made of materials from many parts of the world. Much trading was needed to get these materials to the factory and from the factory to the store.

We have today one way of trading that is rather new. It is our substitute for the wandering merchant. This way is the mail-order catalog. Millions of people, instead of going to stores, choose what they want from a catalog. The merchandise then comes to them by mail or special truck.

In the world today trade is so important that millions of people make their living by it. Trying to picture getting along without trade helps to show how important trade is. (See BARTER; MONEY.)



Bartering in the Days of Ancient Crete

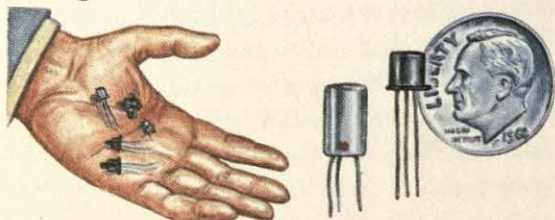


TRAMP STEAMER Thousands of ships travel on the great ocean routes. Many of them follow the same routes year in and year out. Some ships, for instance, bring cargoes from Liverpool to New York. There they pick up cargoes and carry them back to Liverpool. Back and forth across the ocean they go time and time again.

But some ships will go wherever there is a cargo to be taken. They have no regular routes. These ships are called tramp steamers or ocean tramps. They are the cruising taxicabs of the sea. A tramp steamer might take a cargo from Liverpool to Hong Kong. There it might pick up a cargo for Cape Town in South Africa. From there it might sail to Bombay. And so on and on. It may be several years before a tramp steamer gets back to the port from which it started. (See **HARBORS AND PORTS**; **SHIPS**.)

TRANSISTOR Twenty years ago almost no one had heard of a transistor. Today transistors have taken the place of vacuum tubes in many radios and other electronic devices. Transistors are tiny. But being small is not the only advantage of a transistor. A transistor gives off very little heat. It needs only a weak current to make it work. And it lasts almost forever.

Transistors like those pictured contain tiny slabs cut from crystals of germanium. The germanium is first made remarkably



pure. Then it is "doped" with very small amounts of other substances and made to form crystals.

Today "chips" are taking the place of separate transistors in many devices. Chips are called IC's—short for "integrated circuits." They are very thin slices of silicon, some small enough to go through the eye of a needle. Tiny as it is, a chip may have 20 or more transistors arranged in circuits. (See **ELECTRONICS**; **RADIO**.)

TRANSPORTATION From the very earliest times people have wanted to go from one place to another faster than their legs could take them. They have wanted, too, to carry from one place to another heavier loads than they could move by themselves. The story of transportation begins, therefore, thousands of years ago.

The story of transportation is really three stories in one: the stories of travel by land, travel by water, and travel by air. The picture on the next page shows some of the means of transportation on land people have used over the centuries. Of course, it does not show them all.

Two of the most important steps in the story of transportation on land were the taming of such animals as the horse, donkey, ox, and camel and the invention of the wheel. If these two steps had never been taken, we would still have no better means of travel by land than going on foot and dragging or carrying our loads. Many different animals proved to be good beasts of burden. Reindeer and sledge dogs were very helpful in the Far North. In high mountains yaks and llamas became the load carriers. Today machines are taking the place of animals for transportation in much of the world. Roads are crowded with trucks, buses, and passenger cars. Thousands of trains run on many thousands of miles of railroad track. Bicycles and motorcycles help, too. All these vehicles have wheels.

The story of travel by water is the story of boats and ships. The first boats were

LAND TRANSPORTATION



hollowed-out logs that had to be rowed or paddled along. Then the wind was harnessed to push boats through the water. Sails finally gave way in the main to engines that could drive boats or ships by turning wheels or propellers.

The story of travel by air begins much, much later than the stories of travel by land and water. Early people dreamed of travel by air, but bringing it about took thousands of years. The first air travel was by balloons that floated freely. Then came

balloons that could be guided. Airplanes came next—first airplanes with gasoline engines and propellers and then jet planes. Now rockets have come into the picture. Rocket planes have carried their pilots more than 50 miles above the earth. And giant rockets have sent hundreds of satellites, some of them manned, into space.

The story of transportation has not ended. Many people are working to plan faster and better ways for both people and goods to travel. (See SPEED; WHEELS.)

TREES The biggest tree is the biggest of all living things. The tallest redwood is over three times as tall as the longest whale is long. The oldest tree is the oldest of all living things. There are trees alive today that were 3,000 years old when Columbus first reached the shores of America.

Trees are plants. Many people have the idea that trees are too big to be called plants. But this idea is wrong. Any plant that has a woody stem strong enough to stand by itself and that grows to be 20 feet tall may be called a tree. The main difference between a big bush and a small tree is this: a tree has a main stem growing up from the ground, while a bush is likely to have several stems. The main stem of a tree is called a trunk.

All of a tree which is above the ground is called the crown. The root system is the part belowground. The roots branch and branch again just as the typical tree trunk aboveground does. As a rule there is almost as much of a tree belowground as aboveground. A tree's roots hold it in place. They also soak up the water and minerals the tree must get from the soil. A tree's leaves are its food factories. The leaves cannot make food without light. A tree's trunk and branches hold the leaves up in the sunlight. They carry water and minerals to the leaves. They also carry food from the leaves to the rest of the tree.

A tree never stops growing. No matter how old it is, it keeps on getting taller and bigger around. The trunk grows thicker all the way from the base to the top. Branches grow thicker all the way from one end to the other. But all the growing longer takes place at the top of the trunk and at the outer ends of the branches. A branch that grows from the trunk ten feet from the ground is always ten feet from the ground where it joins the trunk.

After a tree is cut down, it is rather easy in most cases to tell from the wood how old the tree was. The age of most kinds of trees can be told from rings in the wood



Winter



Summer



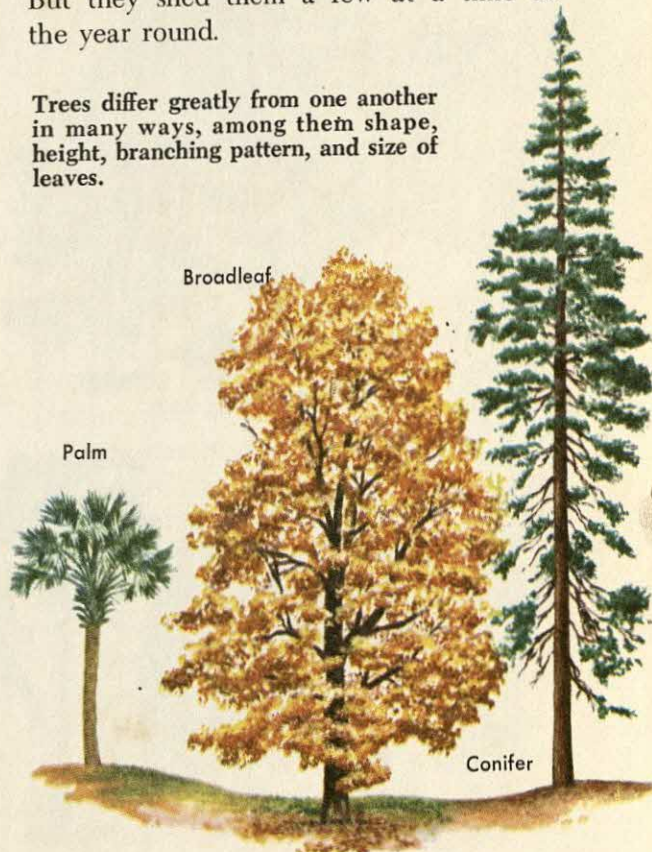
Fall

of their trunks. In the trunks of these trees a layer of new wood is made each year outside the old wood. When the trunk of the tree is sawed across, each layer of wood shows as a ring.

Many of our trees belong to the big group called conifers. "Conifer" means "cone bearer." Conifers produce seeds, but, unlike most seed plants, they do not have flowers. Most of them produce their seeds in cones. Conifers have narrow leaves. Some have leaves so narrow that they are called needles.

Most conifers are evergreens. Christmas trees are conifers. Even though they are always green, conifers shed their leaves. But they shed them a few at a time all the year round.

Trees differ greatly from one another in many ways, among them shape, height, branching pattern, and size of leaves.





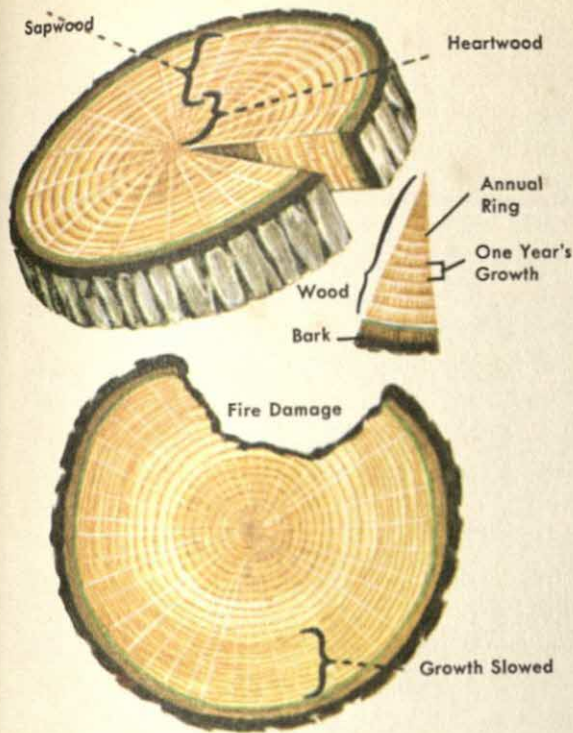
Conifers are sometimes called softwoods. The name is not a good one, for some of them have wood that is hard.

Almost all the trees that are not conifers are called broad-leaved trees. These trees, in places with cold winters, drop their leaves in the fall and grow new ones in the spring. Broad-leaved trees all have flowers that produce seeds. Some of them have big, showy flowers. Others have such tiny flowers that people do not notice them.

Hardwoods is another name for broad-leaved trees. It, too, is a poor name, for many broad-leaved trees have soft wood.

Every kind of tree has its own shape of leaf, its own kind of bark, its own way of branching, its own type of bud, and its own special shape. Every hardwood tree has its own kind of flower and its own special way of wrapping up its seeds in a package. Every conifer has its own kind of cone. If a hardwood tree is bare, its shape and its bark are probably the biggest helps in telling what kind of tree it is. If it has leaves, the leaves are its name tags.

Trees are very, very helpful to us. All our wood comes from them. Many of our fruits grow on trees. So do most nuts. Some trees give us the milky juice from which rubber is made. Some give us drugs. Turpentine comes from pine trees. Maple



sugar comes from maple trees. Most paper is made from wood pulp. Trees help keep soil from washing away. They give homes to birds and to many other animals. They shade our streets and lawns. But even if trees did not help us in all these ways we would still want trees for their beauty. (See BANYAN; BARK; BIG TREE; CONIFERS; GINKGO; OAKS; SHRUBS.)

TREE SURGERY When we are hurt, we call in a doctor. If an operation is needed, we call in a special kind of doctor called a surgeon. There are tree doctors just as there are doctors for people. Since most tree injuries call for some kind of operation on the trees, tree doctors are called tree surgeons. Treating injured trees is called tree surgery.

Trees may be injured in many ways. Ice storms and strong winds may break off some of their branches. Lightning may strike them, and fire may do them damage. People may trim them badly. The bark of a tree is a great protection. If a tree is injured so that the bark of the tree is taken away in places, bacteria, viruses, and fungi

may get into the wounds and cause decay. Insects, too, may get in and begin boring into the wood. If nothing is done to help the tree it may soon die.

If the trunk of a tree has begun to decay, the tree surgeon cleans out the decayed wood. He paints the walls of the cavity with something that will protect it from further damage. If the cavity is big, he may fill it with concrete or some other material. His work is somewhat like the work a dentist does in filling a tooth. He may instead build braces inside the cavity and make an opening at the bottom for draining away water. He may have to build another



Tree Surgeon Bracing Tree Limb

kind of brace to keep a heavy branch from breaking away from the trunk. He may have to saw off some branches. Wherever he makes a cut, he is careful to paint it.

Tree doctors are needed not only to care for injured trees but also to keep trees healthy. Much of their work is in pruning trees properly, spraying or dusting them to protect them from insect pests and tree diseases, and fertilizing the soil around them.

If trees grew big in a few weeks, months, or years, tree surgery would not be so important. But many of our trees are half a century old, and some are far older than that. If a big tree dies, it may be many, many years before another can replace it.

TRILOBITE Six hundred million years ago the largest animals on earth were trilobites. The trilobites were the most intelligent animals on earth then, too. But they were not very large as animals go today, and they were not very intelligent. Not many of them were more than three inches long, and they were no more intelligent than today's grasshoppers.

No one ever saw a trilobite alive. The last one disappeared millions of years before there were any people on the earth. We know about them because there are many fossils of them in rocks that were formed long ago under the sea.

From fossils of them scientists can tell that a trilobite had a hard outer covering. This hard covering was divided lengthwise into three lobes. The name "trilobite" means "three-lobed." Trilobites had long feelers and big compound eyes. They had gills for breathing and legs for walking. They lived in shallow water along the seashores and caught small animals for food.

For millions of years the trilobites were the rulers of the seas. This long period is

often called the Age of Trilobites. Even after the fishes appeared there were still many trilobites. But in time they all disappeared. No one knows why. The trilobites had many neighbors. Corals, sponges, and snails were among them. There are still corals and sponges and snails in the sea. But there are not any trilobites or even any close relatives of the trilobites.

The trilobites belong to the great group of jointed-legged animals called arthropods. The crustaceans and horseshoe crabs of today are distant cousins of these ancient animals. (See EARTH HISTORY; FOSSILS; LIFE THROUGH THE AGES.)

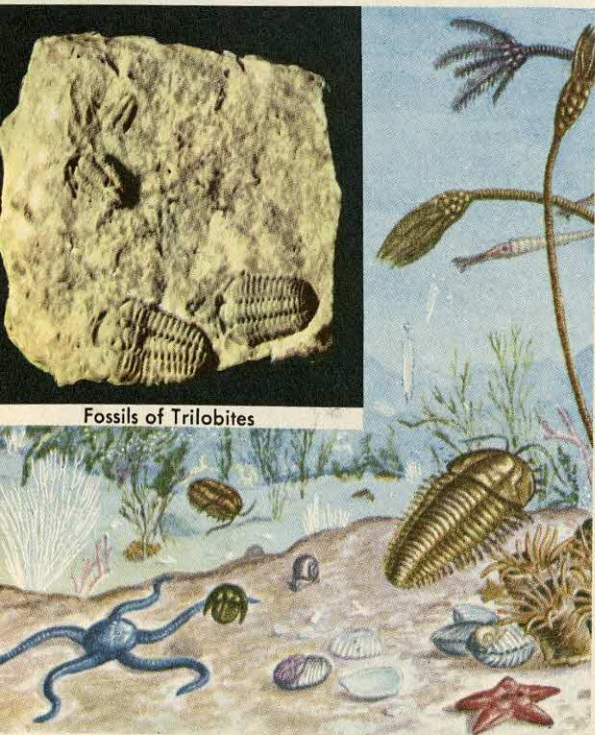
TROJAN WAR Many of the most interesting stories that have come down to us from ancient Greece are about the Trojan War. Achilles is one of the Greek heroes in those stories. Odysseus (Ulysses), Agamemnon, and Ajax are others. Hector is a Trojan hero. These stories are found in Homer's *Iliad* and Virgil's *Aeneid*.

The stories tell that the Trojan War began in this way: Paris, the son of the king of Troy, had been the judge in a beauty contest in which three goddesses had taken part. He named Aphrodite, the goddess of love, the winner. As a bribe this goddess had promised him the most beautiful woman in the world for a wife. The most beautiful woman was Helen. She was already the wife of Menelaus, the king of Sparta. But with the help of the goddess of love Paris carried her off.

At once Menelaus asked the other Greek kings to help him right this wrong. In two years a great fleet of ships carrying thousands of warriors set sail for Troy.

For nine years or more, the stories say, the Greeks and Trojans fought. There were great battles. But neither side could win. The high, thick walls of Troy protected it.

Finally Odysseus thought of a plan. The Greeks built a huge, hollow wooden horse. It was so big that several warriors could stand inside it. The Greeks moved the horse



Fossils of Trilobites

Sea Life in the Age of Trilobites

close to the walls of Troy. Then they pretended that they were sailing back to Greece. Actually the ships went only far enough to be out of sight.

The Trojans thought that the wonderful horse had been left for them as a gift. They brought it into the city. That night the warriors inside the horse came out. They unlocked the gates of Troy. By this time the Greek ships had come back. All the Greek warriors rushed in through the open gates. They killed the king and many of his warriors. They set fire to the city, too. Only ruins were left.

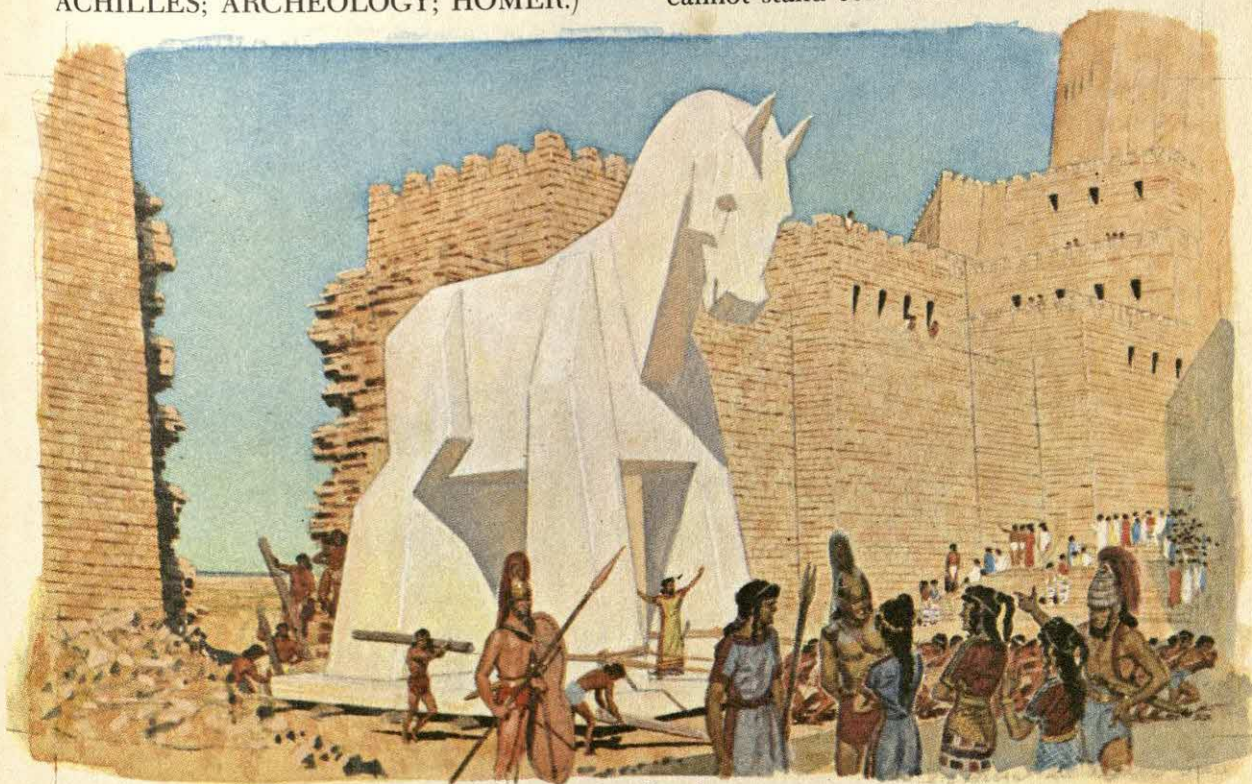
For years people thought that the stories of the Trojan War were just stories. They did not believe that there ever had been a city of Troy. But in 1870 a German scientist, Heinrich Schliemann, decided to investigate a low hill near the coast of Asia Minor. Buried under the hill he found the ruins of the city of Troy. Parts of the great walls could still be seen. The ruins were about 3,000 years old. They showed that the city had been burned down after a long siege and much fighting. At least a part of the story of the Trojan War is true. (See **ACHILLES; ARCHEOLOGY; HOMER.**)

TROPICAL FISHES For years goldfish were almost the only fish kept in fishbowls in our houses. Now tropical fishes are popular. Like goldfish, they are fun to watch, they have pretty colors, and they do not make any disturbing noise.

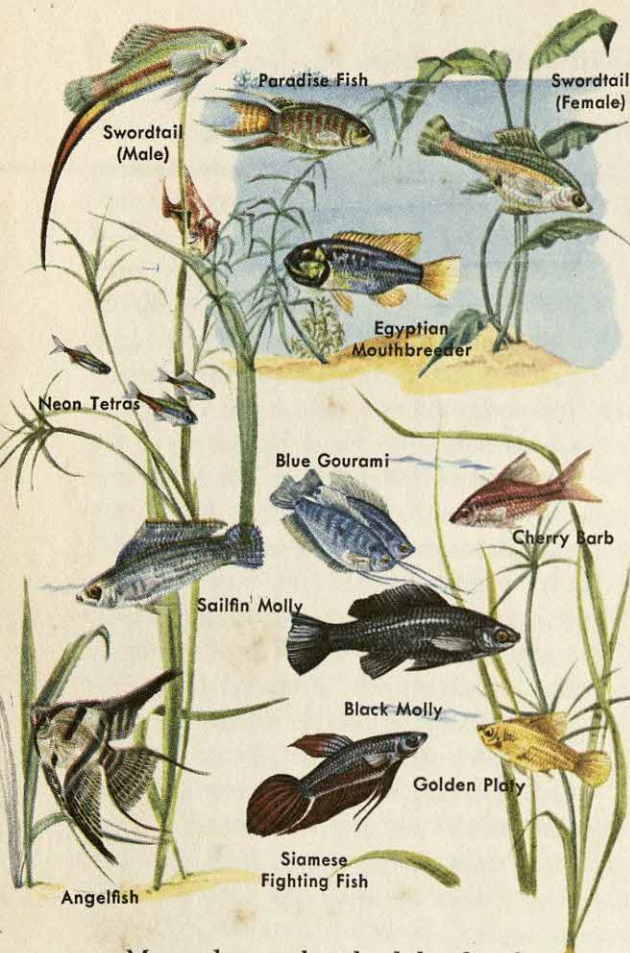
Hundreds of kinds of fish, large and small, live in the tropics. But "tropical fish" now means any small and bright-colored fish that can be raised in an aquarium. Most are freshwater fishes. Some kinds of tropical fish have never been in the tropics. They have been developed by fish breeders from other small, colorful fishes. But some tropical fishes are truly tropical.

Many tropical fishes are live-bearing. They do not lay eggs. Instead, they keep their eggs inside their bodies until the eggs develop into little fish. Then the little fish are born. A tiny, newborn fish looks as if it were almost all eye and tail.

It seems strange, but most tropical fish are cannibals. They eat their young if they can catch them. In raising tropical fish care must be taken to keep the babies from being eaten. Care must be taken, too, not to let the water get too cold. Tropical fish cannot stand cold water.



Trojan Horse



More than a hundred kinds of tropical fish can be bought. The guppy, or rainbow fish, is the most popular one. It is cheap and easy to take care of and is, moreover, a live-bearing fish. The picture shows a few of the many other kinds of tropical fish. Two favorites not pictured are the head-and-tail-light fish and the white cloud. (See **AQUARIUM; FISHES; GOLDFISH.**)

TROUBADOUR For many of the people of Europe during the Middle Ages, life was rather grim. But it was brightened from time to time by such things as tournaments between knights, fairs, and singers who went from castle to castle and town to town. Often a singer had with him a jongleur, or juggler, to help him entertain the crowds that gathered around.

Perhaps the most famous of the medieval singers were the troubadours of southern France. They were at their height in the

12th century. The troubadours were poets who sang their poems instead of saying them. One troubadour wrote, "A verse without music is like a mill without water." Often a troubadour accompanied himself with some instrument, perhaps a citole or a mandora. Or he might have a jongleur companion to do the accompanying.

The songs of the troubadours were mostly romantic songs. Some were pastorelas telling of a shepherdess and her lover. Others were serenades sung in praise of a beautiful lady. But there were also long poems telling of heroic deeds. And some were religious. Through their singing the troubadours did a great deal to keep alive the love of music and poetry.

Many troubadours are still known to this day. And some of their songs remain.

Some nobles of the time took an especial interest in troubadours. Among them were Eleanor of Aquitaine and her famous son King Richard the Lion-Hearted. Some nobles themselves were troubadours.

Much like the troubadours were the trouvères of northern France, who appeared a little later. At the same time there were many poet-musicians in Germany. They were called minnesingers. (See **ROLAND.**)





TSCHAIKOWSKY, PËTR ILICH (1840–1893) Almost every boy and girl knows *The Nutcracker Suite*, with its “Dance of the Sugar Plum Fairy” and “Waltz of the Flowers.” *The Nutcracker Suite* was written as a ballet, but many more people have heard the music than have seen the ballet. Christmas programs certainly would not be the same without this group of gay dances. They were written by Pëtr Ilich Tschaikowsky, probably the best known of all Russian composers.

Tschaikowsky wrote music of many kinds—operas, songs, symphonies, ballets, and piano concertos. Not all his music is gay; some is sad.

Some of his other compositions are almost, if not quite, as well known as *The Nutcracker Suite*. Among them are the *Swan Lake* and *Sleeping Beauty* ballets, the *Romeo and Juliet* overture, the *Piano Concerto in B-flat minor*, and the *Symphony No. 6*, called the *Pathétique*.

Many of Tschaikowsky's writings are very tuneful. Several popular songs have tunes borrowed from them.

Tschaikowsky was born in the small town of Votkinsk in the Ural Mountains. His father was a mining engineer. As a

boy Tschaikowsky loved music, but he did not think of giving his life to it. He planned to be a lawyer. When he was old enough, he began to study law. But at 21 he decided that music was much more interesting and entered the conservatory at St. Petersburg. After he graduated five years later, he was made a professor in the Moscow Conservatory. Along with his teaching, he wrote a great deal of music.

His compositions are so popular now that it is hard to believe that at first they were not at all popular. But for over ten years his operas were failures and few people paid much attention to anything else he wrote. From 1866 on he suffered at times from a nervous illness that made him feel discouraged and sad. At times he wanted to kill himself. He gave up teaching in 1881 and spent the rest of his life composing and traveling.

Tschaikowsky was only 53 when he died. But he lived long enough to know that his music was being played far and wide over the world. (See **BALLET**; **COMPOSERS**.)

TUBERCULOSIS This disease, which usually affects the lungs, used to be called the great white plague. It was the chief cause of death 60 years ago. In some lands it still is. But it should not be. For now doctors have found out what causes it and how to treat it.

Tuberculosis is caused by rod-shaped bacteria, or bacilli. It is very contagious; the bacteria are carried readily from one person to another.

The disease can easily be cured if a doctor finds out about it early. Unfortunately, people may have it for a long time without knowing it. A good plan for everyone is to go for a checkup every year. Once rest, fresh air, and good food were the chief hopes for curing tuberculosis. They still are important. But now there are medicines and other treatments. In some countries vaccines are used to protect people from the disease. (See **DISEASES**.)



TUNNELS It is sometimes easier to cut through a mountain than to build a road or railroad around it or over it. It is sometimes better to tunnel under a river or an arm of the sea than to build a bridge across it. It is sometimes necessary, in order to keep streets from being too crowded, to build tunnels for traffic underground. And tunnels may be needed for carrying water or reaching coal or other minerals. There are many thousands of miles of tunnels in the world.

Men have been building tunnels for many centuries. The Babylonians dug a tunnel under the Euphrates River over 4,000 years ago. The ancient Egyptians, Greeks, and Romans built tunnels, too. Most medieval castles had secret tunnels for escape.

Building a tunnel through solid rock is not easy. But it may be easier than building one in loose sand. In solid rock a tunnel holds its shape. Almost always it is lined to keep loose bits of rock from falling from the walls, but usually there is no hurry about putting in the lining. Explosives play an important part in tunneling through solid rock. Today great tunneling machines do much of the work men used to do.

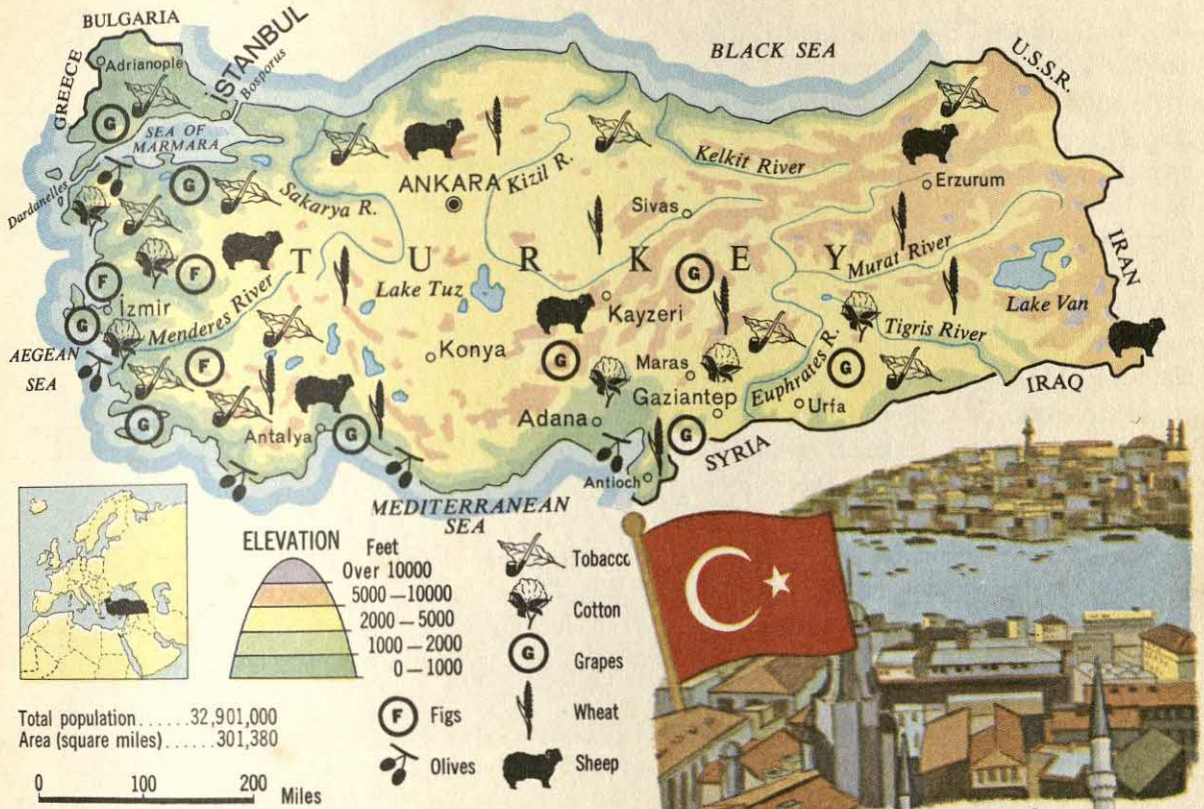
Tunnels dug in sand must be lined as they are dug to keep the sides from caving in. In the building of many tunnels compressed air must be used to keep water out. If a tunnel is to be fairly near the surface, it may be done by cut-and-cover. A great trench is dug and a huge tube of concrete

and steel built aboveground. Then the tube is lowered into the trench and covered up.

In many cases a tunnel is dug from both ends at the same time. It is not easy to make the two halves meet as they should. The two halves of the 7-mile Mont Blanc Tunnel in the Alps, the longest tunnel for cars in the world, were within 5 inches of a perfect match. Today a laser beam may be used to help keep the builders of a tunnel on target.

The 12-mile Simplon Tunnel in the Alps is the longest railroad tunnel in the world. The longest similar tunnel in the United States is the nearly-8-mile New Cascade Tunnel in Washington. The longest of all underwater tunnels for cars is the Bart Trans-Bay Tube under San Francisco Bay. It is over $3\frac{1}{2}$ miles long, considerably longer than the former record holder, the Queensway Tunnel under the Mersey River in England. There are longer underwater tunnels for carrying water. Tunnels, for instance, bring water to Chicago from intakes several miles out in Lake Michigan.

A number of exciting tunnels are in the building or planning stages. One is a $51\frac{1}{2}$ -mile tunnel to bring water to the arid heart of South Africa. Another is a $22\frac{1}{2}$ -mile undersea electric-train tunnel linking the Japanese islands of Hokkaido and Honshu. A third is a 30-mile tunnel under the English Channel to carry both car and railroad traffic between England and France. (See CAISSON; SUBWAY.)



TURKEY Asia Minor and a small bit of Europe nearby make up the country of Turkey. It is all that is left of a once vast Turkish Empire that had in it southeast Europe, most of what we call the Near East, and much of North Africa.

Most Turks, like most Arabs, are Moslems. But the Turks are not Arabs. Both the Arabs in Africa and the Near East and the Christians in southeast Europe were unhappy under Turkish rule.

The Turkish rulers, or sultans, were not able to hold their great empire. But as late as the time of World War I the Turkish Empire was still much larger than Turkey is now. It lost a great deal of land because it fought on Germany's side in that war.

After the war a strong leader who came to be called Atatürk arose and overthrew the sultan. Turkey became a republic with Atatürk the head of it.

When he became its president Turkey was a backward country. Atatürk set about at once to modernize it. He introduced a different alphabet to make learning to read



Istanbul



Mosque



Wheat Fields



Roses for Perfume

Fishermen

and write easier. He started new schools and factories. He even ordered men to stop wearing the little round cap called a fez and women to stop wearing face veils. He brought in some farm machinery. Atatürk died in 1938, but his changes and improvements are left.

Now as in earlier days most of the Turks are farmers or herdsman. Much of the farming is still done with the help of oxen and simple hand tools. The herdsman are found in the central part of the country. It is a high, dry plateau rimmed around with mountains. Along the coasts there is much good cropland. Some of it is irrigated. Figs, olives, tobacco, wheat, barley, sugar beets, cotton, and grapes are among the crops raised. Opium is another important crop.

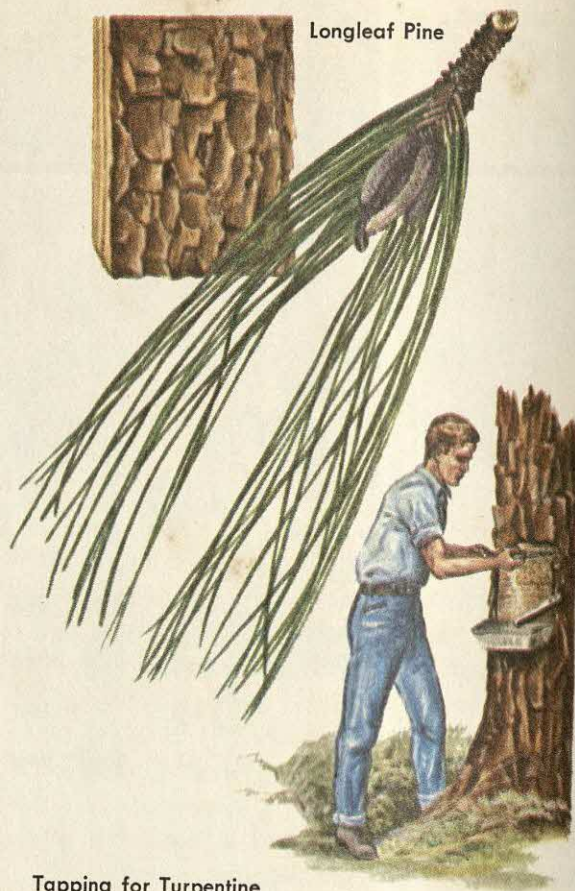
Turkey's largest city is Istanbul. It used to be called Constantinople. Istanbul is a great trading city. The capital is Ankara, a city rebuilt and modernized by Atatürk.

The Turkish government has helped farmers get more and better products from their land. It has helped establish factories for using those products. In 1948 and 1951 petroleum was discovered in Turkey. The country is rich in minerals. New roads and airports have been built. In many ways Turkey is a changing land. (See BOSPORUS; DARDANELLES; ISTANBUL.)

TURPENTINE The best way to tell whether a thin, colorless liquid is turpentine is to smell it. Turpentine has a strong odor all its own.

Turpentine is made from an oily juice present in pine trees. More than half of the world's supply of turpentine is produced from the pine trees of southeastern United States.

The juice is taken from the pine trees in much the same way that maple "sap" is taken from sugar maple trees. A part of the bark of the pine tree is cut away with a special tool. Then a cup or tray is placed to catch the thick, gummy liquid that drips from the tree through the cut.



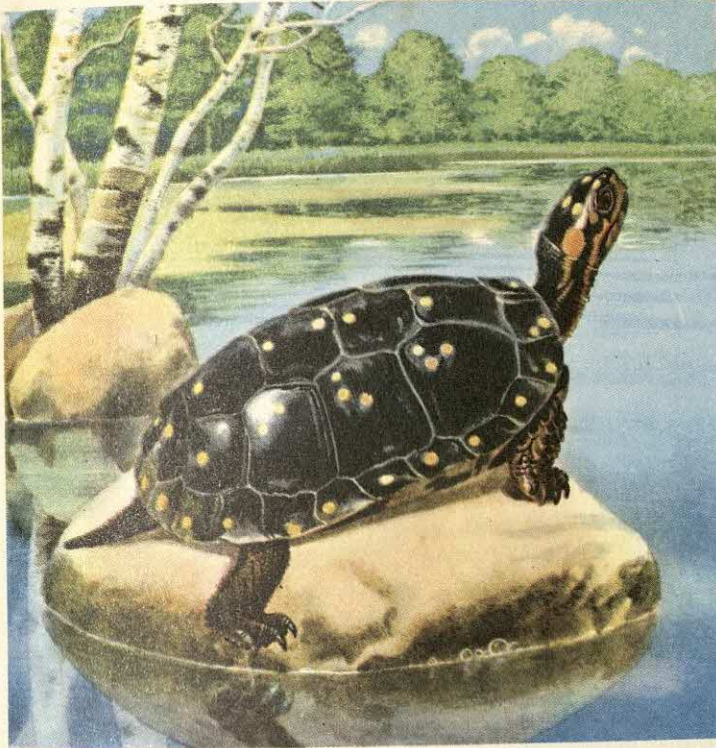
Tapping for Turpentine

This juice is then boiled. The vapor which comes off during the boiling travels along coiled cooling tubes. There it changes back to a liquid, which is called oil, or spirit, of turpentine. Other useful substances, among them tar and pitch, come from the rest of the juice. Much of it hardens into a clear, yellowish solid called rosin. Rosin has many uses. One of the best known is the rosin of violin bows.

Long ago people who took crude turpentine from pine trees were not careful how they did it, and many of the trees died. Now care is taken not to harm the trees.

Spirit of turpentine is useful in many ways. It is probably most used to thin oil paint and varnish. It is often used to remove paint. It is also used in making some medicines, insecticides, and plastics.

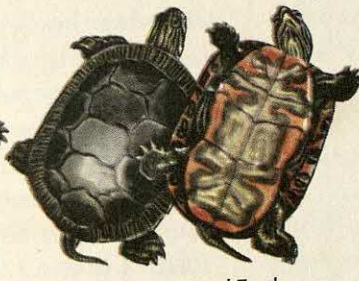
Turpentine is very inflammable. Care must be taken in using it and storing it. (See PAINT; PLANT FACTORIES.)



The small spotted turtle lives in fresh water.



Mississippi Painted Turtle



Western Painted Turtle

TURTLES No one finds it hard to tell turtles from their reptile cousins—the snakes, lizards, alligators, and crocodiles. A turtle's shell is its name tag. All the many kinds of turtles have shells. None of the other reptiles do. Turtles are well protected by their shells. A box turtle can pull in its head, tail, and legs and shut itself up completely.

Some turtles live in salt water, some in fresh water, and some on land. Land turtles are often called tortoises.

All turtles lay their eggs on land. The mother turtle takes no care of her babies. She lays her eggs and then leaves them. The turtlets often have to struggle hard to break through the tough egg covering.



Leatherback Turtle



Green Turtle



Mud Turtle



Snapping Turtle



Soft-shelled Turtle



False Map Turtle

A great many turtles never grow to be more than a few inches long. But some grow to be huge. The leatherback may be 8 feet long and weigh three-quarters of a ton.

Some turtles live longer than any other animals we know about. A giant tortoise may live for well over 100 years. (See AGE; REPTILES.)

Box Turtle Laying Eggs



TUSSAUD (too SO), **MADAME MARIE**, (1760–1850) For many years one of the favorite tourist sights in London has been Madame Tussaud's Exhibition. Visitors who ask questions of the guards there are sometimes shocked when the guards do not answer. Some of the "guards," like all the rest of the figures exhibited, are wax dummies. The fact that people ask them questions proves how lifelike they are.

Madame Tussaud's Exhibition, also called Madame Tussaud's Waxworks, is a collection of life-size wax statues of famous people of the past and of the present. Many of the figures wear clothing once worn by the people they represent.

Madame Tussaud, who was Swiss, went to Paris as a young woman. There she learned to make models in a wax museum run by her uncle. She went to London and set up her own exhibition in 1802.

The use of beeswax for modeling figures goes back many centuries before the time of Madame Tussaud. Wax figures have been found in ancient Egyptian tombs. Wax is easy to color, easy to carve, and easy to melt and pour into molds.

A special section of Madame Tussaud's Waxworks is called the "Chamber of Horrors." This section shows famous crimes of the past. There are many wax museums today patterned after Madame Tussaud's.



Madame Tussaud

Wax Figure
of Napoleon



Gold Mask of
Tutankhamen

Paul Scherer

TUTANKHAMEN (toot ahnk AH men) Tutankhamen was the ruler of Egypt about 3,300 years ago. He is sometimes called King Tut. Tutankhamen was not one of Egypt's great rulers. He was a boy of 10 when he became pharaoh and only 19 years old when he died. As a ruler he could not hold his own against the priests and nobles. He could not make any decisions himself. His chief accomplishment was to add to the splendor of the temples built to the god Amen. He is not famous for things he did. He is famous because of the rich treasures found in his tomb.

All the rulers of ancient Egypt had stores of treasure buried with them. The Egyptians believed that for a happy afterlife the king would need all the things he enjoyed in this life. Furniture, jewels, food, weapons, and clothing were therefore buried with him. Of course, the people of Egypt knew that the tombs of their rulers were great treasure-houses. Other royal tombs were opened and their treasures stolen from them long ago. But almost nothing had been taken from King Tut's tomb before it was discovered in 1922. When it was opened, people were amazed at the treasure in it. Newspapers and magazines were full of stories about it. Most of the treasure is now in a museum at Cairo. (See EGYPT.)

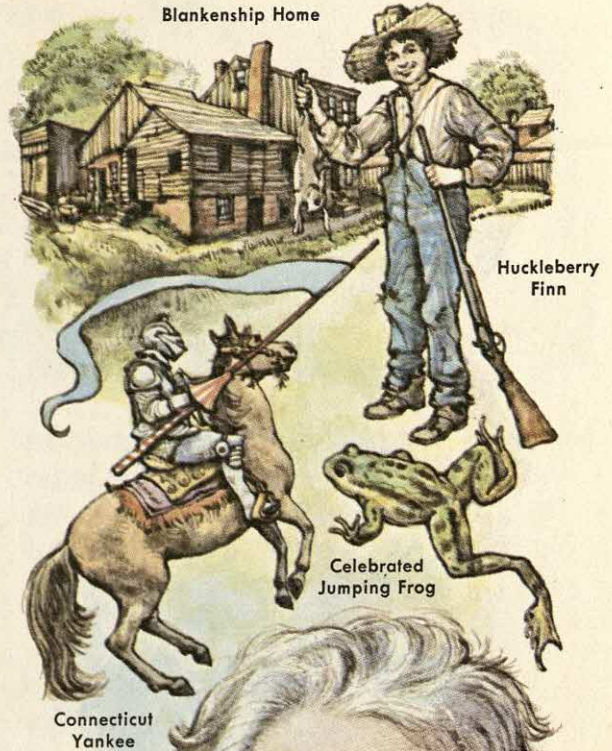
TWAIN, MARK (1835–1910) Samuel Langhorne Clemens, known to most people as Mark Twain, was born in a small town near Hannibal, Mo. He spent his boyhood in Hannibal, which is on the Mississippi River. When he grew up he became a river pilot.

Later he went west and worked as a newspaper reporter in Virginia City, Nev. While he was on this job he began to sign his articles "Mark Twain." These words, used by river pilots, mean "two fathoms (12 feet) deep." From then on Clemens used Mark Twain as his pen name.

Clemens worked on other newspapers, traveled, and gave lectures. His first literary success was "The Celebrated Jumping Frog of Calaveras County," published in 1865. In 1869 he published *Innocents Abroad*, a book about his European travels.

Clemens spent summers on his farm near Elmira, N. Y. There he wrote *The Adventures of Tom Sawyer*, published in 1876. The Tom in the story is really Mark Twain. Huckleberry Finn is his close boyhood friend, Tom Blankenship. The book tells of the boys' exciting adventures.

Later Clemens wrote a sequel, *The Adventures of Huckleberry Finn*. *Tom Sawyer* and *Huckleberry Finn* are among the most popular books ever published in the United States. Among Mark Twain's other books are *Joan of Arc*, *The Prince and the Pauper*, *Life on the Mississippi*, and *A Connecticut Yankee in King Arthur's Court*. (See AMERICAN WRITERS; MISSOURI.)



Mark Twain's Birthplace



Riverboat



TWINS The baby boys in the picture are twins. They have the same father and mother and were born at the same time. The two look so much alike that it would be hard to tell them apart. They are, we say, identical twins. Identical twins are always either both girls or both boys.

Not all twins are identical. Nonidentical twins may not look much alike. And one may be a boy and the other a girl.

To understand why some twins are identical and some nonidentical you have to know that every human baby comes from a single cell—a fertilized egg. A fertilized egg is formed when a male cell, or sperm, from the father unites with a female cell, or egg, in the body of the mother. Usually only one egg is fertilized at a time and that egg develops into a baby. The fertilized egg first divides into two cells. The two divide into four, and so on and on until the baby is formed and ready to be born.

But sometimes two egg cells in the mother's body are fertilized at the same time. Each one grows into a baby. The two babies will be born at the same time. There is no reason, however, why they would be any more alike than any two children in the same family. They are nonidentical.

Identical twins come from the very same fertilized egg. It divides into two cells. But the two then break apart. Each one develops into a baby. Since both babies came from the same egg fertilized by the same sperm, they have the same genes and are bound to be identical. (See HEREDITY.)

TYPEWRITER A typewriter is a machine for writing. Typing is a little like playing a piano. The typist presses down one key after another. He learns where the key for each letter or sign is so that he need not look at the keys as he types.

Each key, when it goes down, moves a bar that has a metal letter or sign at the end. The metal letter or sign hits an inked typewriter ribbon and presses it against paper so that it makes a print.

The first practical typewriter was invented by Christopher Sholes, an American, in 1868. In many early machines the typist could not see the paper he was typing on. Typewriters were improved in one way after another. Today many typewriters are electric. The typist has to barely touch the right keys.

Of course, there are different keyboards for different languages. It is hard to build a typewriter for a language that is written in syllable signs instead of in letters. A Chinese typewriter built in 1962 had 5,700 characters. The keyboard was two feet wide and 17 inches high!

There are many special-purpose typewriters. Among them are those that set type for printing and those that write in Braille so that blind people can read the messages. Many typewriters are now built for use with computers.





The letter *U* is one of five letters that came from the letter *Y* in the Phoenician alphabet. The Greeks made two letters of it. One was a vowel with a *u* sound. Forms of it were *V* and *Y*. The Romans took the *V* form of the letter and used it for both a *u* sound and a *v* sound. Sometimes they rounded the base so that the letter was *U*-shaped. In time the two ways of writing it became separate letters. Since *V* and *U* were once the same letter, it is not so puzzling that the letter *W* looks like double *V* but is called double *U*.

U stands for several sounds in English words. It has different sounds in *cube*, *prune*, *up*, *circus*, *burr*, *put*, and *bull*.

UAKARI (wa KAW ree) The uakaris are monkeys. There are three kinds. One kind, as the picture shows, has a red face and almost white fur.

These monkeys live in the jungles of South America. They spend their whole lives in the trees and never come down to



the ground unless they are forced to. They eat fruits of jungle trees. As bands of uakaris travel through the jungles, the baby monkeys ride on their mothers' backs.

Many monkeys have long tails that they can wrap around branches. The uakaris do not. Their tails are short. (See **MONKEYS**.)

ULTRAVIOLET RAYS Sunlight is made up of the rainbow colors: violet, indigo, blue, green, yellow, orange, and red. They come to us from the sun in waves. These waves are not all the same length. Of the rainbow colors violet waves are the shortest and red waves the longest. Besides the waves of color, the sun also sends out some that are longer and some that are shorter than the light waves. We do not see these

waves. Those just shorter than violet waves are called ultraviolet. The sun that people get when they stay in the sunshine is caused by the ultraviolet rays.

The air shuts most of the ultraviolet rays away from the earth. It is good that it does. In big amounts, ultraviolet rays are dangerous. But some are good for us. They help protect us from some diseases. Sunlamps are made to send out ultraviolet rays. On their flights astronauts have used ultraviolet cameras to take pictures of stars. They show much that ordinary pictures cannot show. (See **QUARTZ**.)

UNCLE SAM Uncle Sam is not a real person. He is just an imaginary person who stands for the United States.

The idea of calling the United States Uncle Sam dates back to the early days of the country. During the War of 1812, one story tells, Samuel Wilson and his



brother Ebenezer of Troy, N.Y., supplied beef for the United States Army. The barrels of beef for the army were stamped "U.S." to show that they had been bought by the government. Samuel Wilson was called Uncle Sam by those who knew him well. Workmen began calling the barrels of U.S. beef "Uncle Sam's beef." Soldiers liked Uncle Sam as a nickname for the United States and it gradually spread.

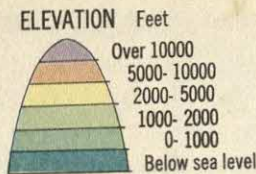
In his pictures Uncle Sam is always tall and thin. He always wears a long-tailed coat and a high hat. His suit has stars and stripes on it like those of the United States flag. (See JOHN BULL.)

UNION OF SOVIET SOCIALIST REPUBLICS The country which now has this long name used to be called Russia. It spreads over eastern Europe and northern Asia, and is by far the largest country in the world. For short, it is often called the U.S.S.R. or the Soviet Union. And some still call it Russia.

For more than 350 years before World War I, emperors called czars had been Russia's rulers. Much earlier, ancestors of the Russians had settled in the area in which the U.S.S.R.'s great capital, Moscow, now stands. By the time they began to push out from that area to find more good land and other riches, western Europe and southern Asia had been settled by other peoples. But little by little the Russians pushed out to the south, east, and north. Under the czars, Russia became almost as large as the Soviet Union is today.

Some big parts of that vast area are deserts. But the region is rich in farmland, grazing land, and forest, and enormously rich in important minerals—oil, coal, iron, copper, lead, and gold, for a few.

In spite of the natural riches of their country, millions of Russians were very poor under the rule of the czars. Peasant farmers paid rich landowners high rents for tiny farms. Most peasants lived in villages of one-room huts built of logs or clay. Day



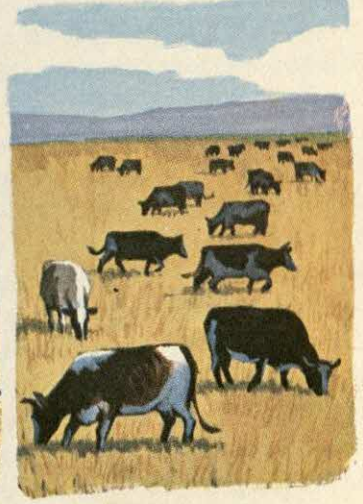
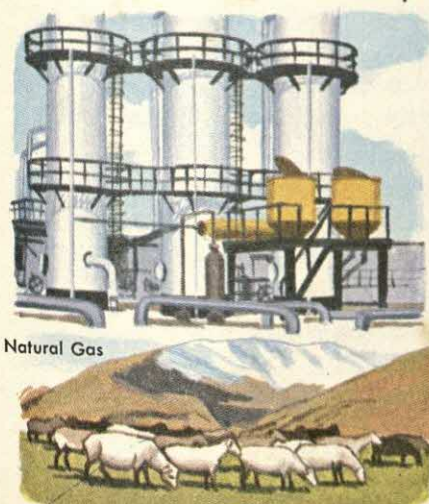
Total population 234,396,000
Area (square miles) 8,649,489

0 Miles 600



after day and year after year their diet consisted chiefly of cabbage soup, potatoes, and hard black bread.

In 1917, during World War I, there were revolts. The czar and his government were overthrown, and there was great chaos. Then there were struggles for power in which many people, rich and poor, lost their lives. Finally, in 1922, the Union of Soviet Socialist Republics was formed. The 15 republics which now are members would not seem to Americans to be republics. People in them do not have rights of many kinds which people in the United States





Steel Mill



Women Farm Workers

have. The government is controlled by a single party—the Communist party.

There is as much land in the U.S.S.R. as there is in all of the mainland of North America. But, unlike North America, the country is much longer from west to east than it is from north to south. As the map shows, the port of Vladivostok is near the southern end of the country's eastern coast. Even that port can be kept open in mid-winter only by using icebreakers. And the country's long northern coast borders the cold Arctic Ocean.

In spite of its great mineral and other riches, the U.S.S.R. has been called "a shivering, shut-in giant, poor in seaports." Winters are long and very cold in most of it. The country is shut in between the Arctic to the north and the neighbors to the south of its very long southern border. Baku, an oil port on the Caspian Sea, is not a seaport. That "sea" is really a huge salt lake with no outlet to any ocean. And although Leningrad, the Soviet Union's chief port, and Odessa, on the Black Sea, are on arms of the Atlantic, they are both far from the open ocean. But powerful jets travel to and from Moscow and link it to the other great cities of the world.

After the Revolution the new leaders set out at once to make the country an industrial nation. The government took control of lands, factories, minerals, and the like. People were assigned to the work their leaders thought it was most helpful for them to do. Many new factories, homes, schools, and even cities were built.

Today the U.S.S.R. is second only to the United States as an industrial country. Signs on the map show where much of the logging, mining, and manufacturing of important kinds are going on. The map also shows where some of the crops are raised. To grow cotton in dry lands east and south of the Aral Sea, a great deal of land there is irrigated.

Most of the land farmed is now in either "collective" or "state" farms. What used to be little farms near a farm village are now parts of huge fields on which big machines are used. Women as well as men work in the fields.

During its short life the Soviet Union has become one of the world's most powerful nations. Several other Communist countries are closely tied to it. With France, the United Kingdom, and the United States, it takes its place as one of the "big four" in shaping world affairs. It shares with the United States, moreover, the leadership in space exploration.

In spite of all the changes that have taken place in the past 50 years, one kind of thing for which Russians are famous seems not to change. It is their love for music and for folk dancing, ballet dancing, and other arts. Much Russian music and many Russian musicians are known throughout the world. (See COMMUNISM; LENINGRAD; MOSCOW; SATELLITES.)

UNITED KINGDOM "United Kingdom" is short for "United Kingdom of Great Britain and Northern Ireland." In it are England, Scotland, Wales, and Northern Ireland. Sometimes the United Kingdom is called simply Britain.



United Nations Buildings and Flag

UNITED NATIONS After World War I many of the nations that had fought in that war decided that they never wanted to go through such a war again. It was foolish, they agreed, to try to settle anything by fighting, and high time for nations to be able to settle their disputes by talking them out. Thus the League of Nations was formed. All the world's leading nations except the United States became members of the League.

The League of Nations was not able to do all that was hoped for it. Barely 20 years after World War I ended, World War II was being fought. As that war was ending, many nations again decided to band together to try to keep the world at peace. They formed the United Nations.

It is more important now than ever before that nations learn to get on peaceably together. If a man who raises flowers lives on one side of a mountain and a man who raises chickens lives on the other, the two men are not likely to quarrel about the damage the chickens might do to the flowers. But the chance of such a quarrel is much greater if the two men live side by side. In the past 100 years the nations of the earth have been in a way moved much closer together. Of course, the world is not really smaller, but new ways of traveling have brought once-distant nations near to one another. In recent years nations half

the way around the earth from one another have become neighbors.

The United Nations was organized in San Francisco in 1945. Delegates of 46 nations were present when the San Francisco meeting opened. Before it closed delegates of four more nations had arrived. Soon another was added, making 51 in all.

At the San Francisco meeting the rules for the United Nations were made. The set of rules drawn up is called the Charter of the United Nations. These are the 51 nations that signed it as original members.

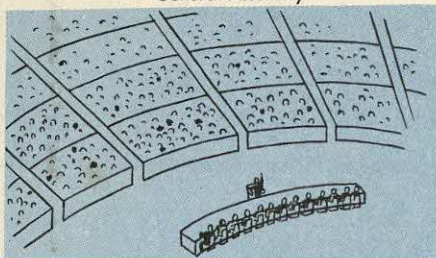
Argentina	Iraq
Australia	Lebanon
Belgium	Liberia
Bolivia	Luxembourg
Brazil	Mexico
Byelorussian S.S.R.	Netherlands
Canada	New Zealand
Chile	Nicaragua
China	Norway
Colombia	Panama
Costa Rica	Paraguay
Cuba	Peru
Czechoslovakia	Philippines
Denmark	Poland
Dominican Republic	Saudi Arabia
Ecuador	Syria
Egypt	Turkey
El Salvador	Ukrainian S.S.R.
Ethiopia	Union of South Africa
France	U.S.S.R.
Greece	United Kingdom
Guatemala	United States
Haiti	Uruguay
Honduras	Venezuela
India	Yugoslavia
Iran	

Checking the list will show that all the countries in the Americas except for the few that have become independent since its establishment are charter members of the United Nations. Three that were then British colonies but are now members are Guyana, Jamaica, and Trinidad and Tobago.

Many other nations that have come into existence since 1945 also have joined the United Nations. Today its list of members is more than twice what it was in the beginning. Some nations have wanted to join but have not been allowed to. Their record makes many members think that they could not be counted on to work for peace.

UNITED NATIONS

Major Divisions



Security Council



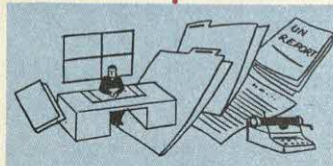
International Court



Trusteeship Council



Economic and Social Council



Secretariat

The United Nations is a complicated organization. There are many different parts set up to do different kinds of work. Settling disputes between nations, helping backward nations help themselves, and trying to help different peoples understand one another better are three of the kinds of work the United Nations carries on.

The General Assembly and the Security Council are the two parts of the United Nations we read and hear most about. The General Assembly is made up of representatives from every member nation. Many problems are aired in the General Assembly, and the nations try to agree as to what should be done. But they leave the actual doing to the Security Council. The General Assembly meets at least once a year. The Security Council meets all year.

There are 15 members of the Security Council (originally only 11). Each member comes from a different country. Five nations always have a representative on the Council. They are the United States, the United Kingdom, Nationalist China, France, and the U.S.S.R. The other 10 (originally 6) are elected by the Assembly. They serve two-year terms.

Bringing all the nations together to work for a better world would be much easier if

all the people of the world spoke the same language. But a delegate from Saudi Arabia is not likely to understand a word a delegate from Norway says. In the same way, the language of a delegate from Greece is really "Greek" to a delegate from Pakistan. Chinese, French, English, Russian, and Spanish are the languages known to the most delegates. Every speech must be given in one of these languages. The speech is immediately translated into the other four.

For a time the plan was to have the yearly meetings in first one country and then another. But the United Nations was given some very valuable land in New York for a site, and buildings were erected. The plan of moving about was given up.

A great many workers are needed to carry on the work of all the branches of the United Nations. Thousands of people are busy in these big buildings every day.

The United Nations has accomplished a great deal. But there have been some problems for which no solutions have yet been found. The fact that there are such problems should not be surprising. It takes time and much practice for people of different languages, different customs, and different ways of thinking and doing things to learn to work smoothly together.

UNITED STATES Only three countries in the world are larger than the United States. They are Canada, China, and the Soviet Union (U.S.S.R.). Of the four the Soviet Union is by far the largest. Canada, China, and the United States do not differ much in size. As the chart below shows, the United States is a giant beside Spain, Portugal, Italy, and the British Isles. It is even larger than the continent of Australia.

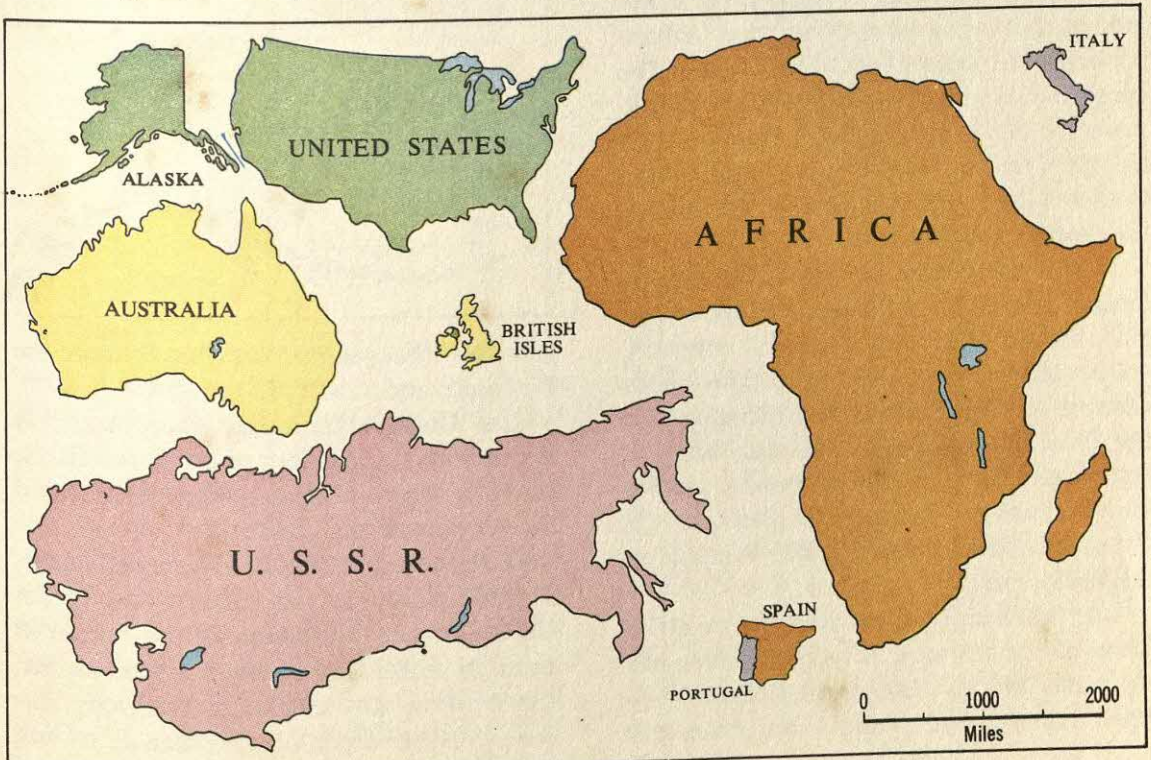
The whole name of the United States is United States of America. For short, the country is often called the U.S.A. The newest state, Hawaii, is made up of islands in the Pacific Ocean. Alaska is northwest of Canada. The other 48 states stretch across North America, south of Canada, all the way from the Atlantic to the Pacific.

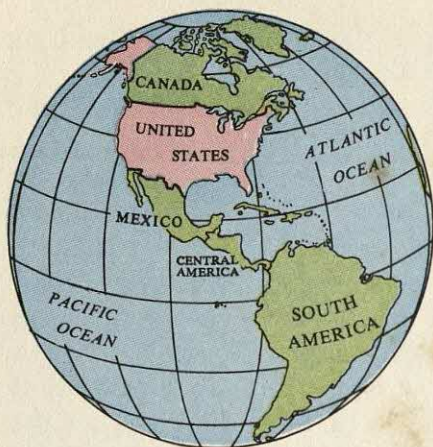
The stretch from ocean to ocean is long. It is so long that different parts of the band are in different time zones. When it is noon in the country's largest Atlantic port, New York, it is only 11 A.M. in Chicago, the largest port on the Great Lakes, 10 A.M. in the mile-high city of Denver, and 9 A.M. in Los Angeles, the largest Pacific port. By

airplane, Los Angeles and New York are 2,460 miles apart.

The Arctic Ocean borders both northern Alaska and northern Canada. The U.S.A., then, has a coast on the world's smallest ocean, the Arctic, as well as coasts on the world's busiest ocean, the Atlantic, and on the world's largest ocean, the Pacific. And ships can sail from United States ports to the Indian Ocean by way of either the Pacific or the Atlantic. Friendly Canada and, to the south, friendly Mexico are the only countries bordering the United States. But from the United States it is not hard to reach most of the rest of the world.

The location of the United States is good in another way, too. In southern Alaska and in all the other states summers are long enough and warm enough for the raising of crops. Yet even in the southernmost states it is not uncomfortably hot all year round as it is in lands near the equator. Some places in the country are just halfway between the equator and the North Pole. The United States, it is sometimes said, spreads across much the best part of the continent.





The small maps on page 1392 tell more about the country's climate.

Notice that one time zone the big map at the right shows is marked "Mountain Standard Time Zone." The great Rocky Mountains run north and south through the states in this zone. Crests of the Rockies form what is called the Great Divide. It is a divide between rivers that flow westward into the Pacific or its arm, the Gulf of California, and those that flow toward the Atlantic or its arm, the Gulf of Mexico.

In much of the high plateau west of the divide little rain falls. But the great Colorado in the Southwest and the great Columbia in the Northwest flow to the Pacific. The gorge cut in the plateau by the Colorado is one of the world's natural wonders. And Hoover Dam on the Colorado and Grand Coulee Dam on the Columbia are among the world's greatest dams.

East of the divide are two of the world's longest rivers. One is the famous Mississippi. It is about 2,500 miles long. The Missouri, one of its branches, is about the same length. Other long branches of the Mississippi are the Ohio, the Illinois, the Arkansas, the Wisconsin, and the Red. The Tennessee and the Cumberland are branches of the Ohio. In the settling of the country, its rivers had an important part.

The Mississippi flows into the Gulf of Mexico. Another of the rivers that flow into the Gulf is the Rio Grande, the "great river." Among the well-known rivers that



flow into the Atlantic are the Hudson, the Potomac, and the St. Lawrence.

The United States has many lakes. It shares with Canada four of the Great Lakes. The fifth, Lake Michigan, is entirely within the borders of the country.

Of the block of 48 states south of Canada, 31 are wholly in the eastern half of the United States. Minnesota is the largest of those 31 states, and Missouri is next largest. Ten of those 31 states border the long Mississippi River. Each of the other 21 eastern



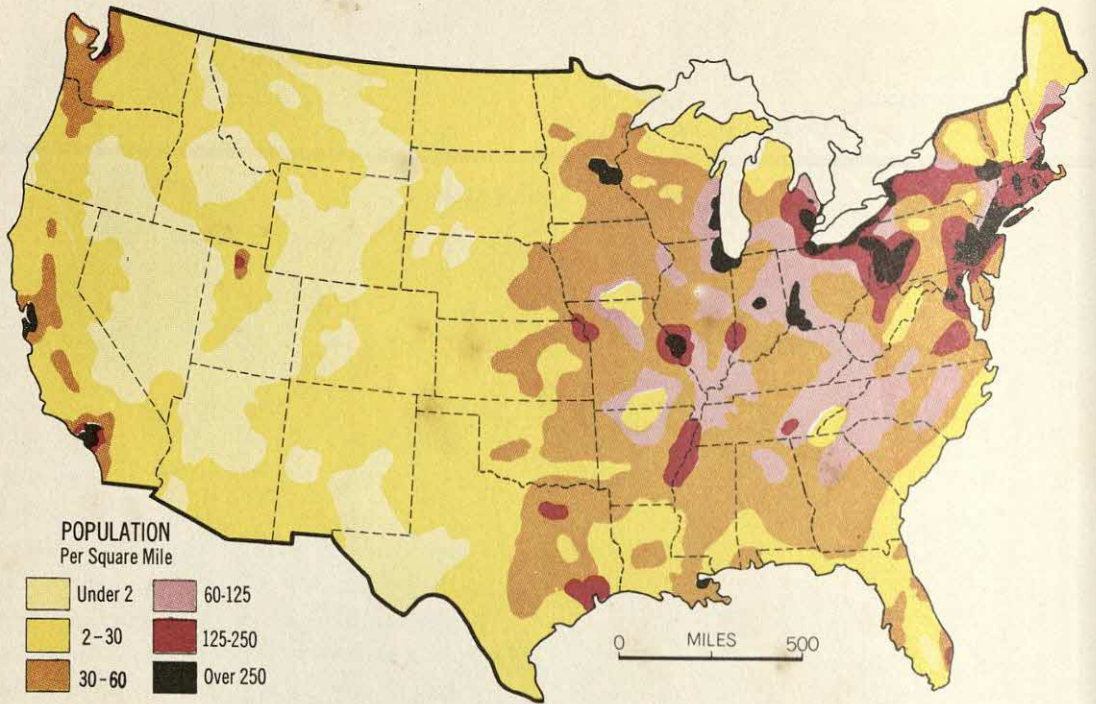
states, except for Vermont and West Virginia, borders either one or more of the Great Lakes, the Atlantic Ocean, or the Gulf of Mexico.

Only 17 of the block of 48 states are in the western half. All 17 are big, and all 17 are young. Texas, the biggest and the oldest of these states, did not become a state till 1845. California, admitted in 1850, is the next biggest and the next oldest.

In the whole United States there are about 200 million people. About three-fourths of

all these people live in the 31 eastern states. But the western state of California leads all 50 states in population. California and Texas together hold more than half of all the people of the western states, including Hawaii and Alaska.

It is not strange that most of the people of the United States live in the eastern half of it. Most of the early settlers in the country came from Europe. The eastern coast is the one to which these settlers came first when they crossed the Atlantic. The whole



eastern half of the country, moreover, gets enough rainfall for crops. In it there is much valuable forest. Even in early days, many factories which used waterpower were successful. And most of the country's riches in iron and coal are in the eastern half of the country.

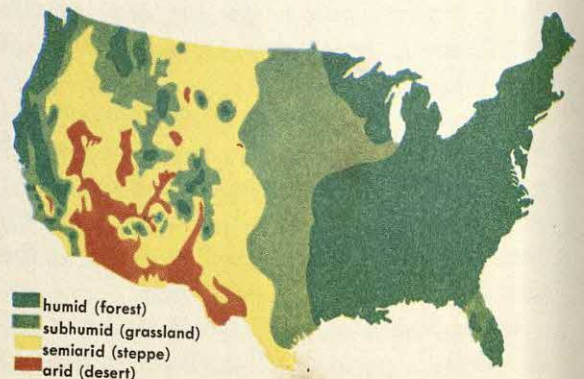
In most parts of the West there is much less rainfall than in the East. Some parts of it are desert in which crops can be raised only on land that can be irrigated. There are valuable forests in the Northwest. Great stretches of the plains in the West are used for big ranches. And in some large sections there is enough rainfall for wheat. Petroleum and many minerals such as copper, lead, and silver are important riches. But all the very high mountains of the country are in the West. And all parts of the West are long distances from the great Atlantic ports in the Northeast.

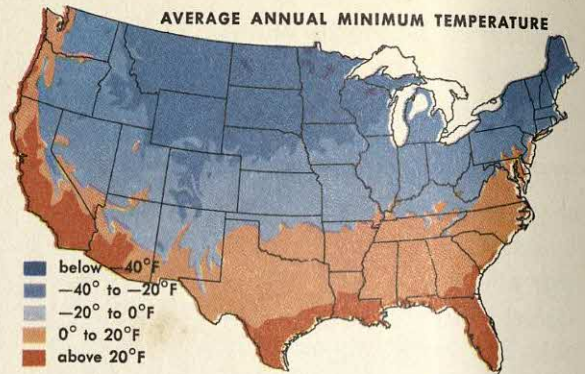
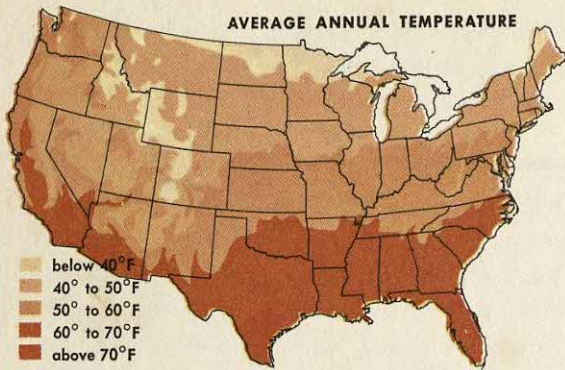
Even though more people live in the East, the people of both East and West depend on the riches of the whole country. Railroads, airlines, ship lines, and well-paved highways link the different parts of the vast country together. And Los Angeles, Detroit,

Philadelphia, Houston, Chicago, and New York are among the world's great cities. Each has more than a million people.

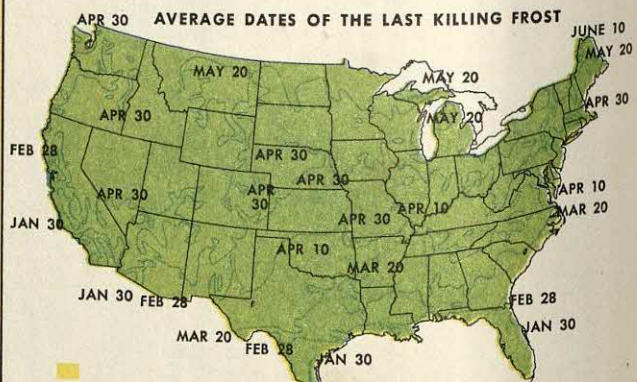
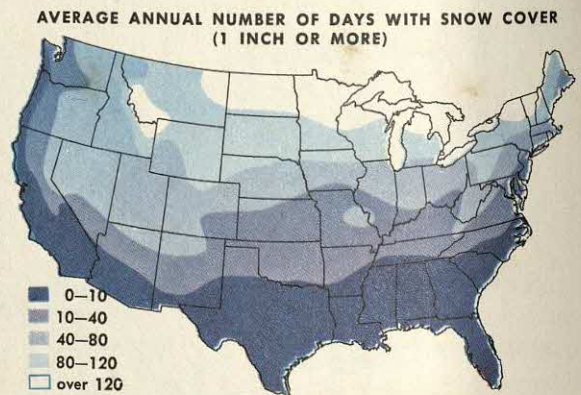
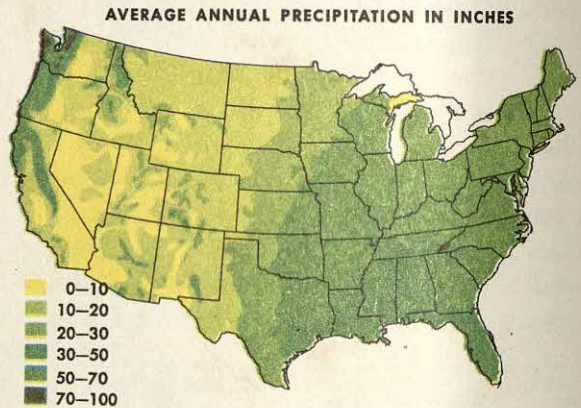
Many of the Europeans who came to live in America were people with special skills. There were experienced farmers and craftsmen. There were lumbermen, miners, and traders, doctors, lawyers, and religious leaders. The skills of the settlers and the country's enormous natural riches both helped in building a great nation.

Fewer than 6 out of every 100 of the world's people live in the United States. But the country produces about one-fifth of the coal, one-sixth of the iron ore, and more than one-fourth of the steel and petroleum





STATE	AREA (SQ. MI.)	POPULATION
Alaska (49th)	586,400	272,000
Texas (28th)	267,339	10,752,000
California (31st)	158,693	18,918,000
Montana (41st)	147,138	702,000
New Mexico (47th)	121,666	1,022,000
Arizona (48th)	113,909	1,618,000
Nevada (36th)	110,540	454,000
Colorado (38th)	104,247	1,977,000
Wyoming (44th)	97,914	329,000
Oregon (33rd)	96,981	1,955,000
Utah (45th)	84,916	1,008,000
Minnesota (32nd)	84,068	3,576,000
Idaho (43rd)	83,557	694,000
Kansas (34th)	82,276	2,250,000
Nebraska (37th)	77,227	1,456,000
South Dakota (40th)	77,047	682,000
North Dakota (39th)	70,665	650,000
Oklahoma (46th)	69,919	2,458,000
Missouri (24th)	69,674	4,508,000
Washington (42nd)	68,192	2,980,000
Georgia (4th)	58,876	4,459,000
Florida (27th)	58,560	5,941,000
Michigan (26th)	58,216	8,374,000
Illinois (21st)	56,400	10,722,000
Iowa (29th)	56,290	2,747,000
Wisconsin (30th)	56,154	4,161,000
Arkansas (25th)	53,104	1,955,000
North Carolina (12th)	52,712	5,000,000
Alabama (22nd)	51,609	3,517,000
New York (11th)	49,576	18,258,000
Louisiana (18th)	48,523	3,603,000
Mississippi (20th)	47,716	2,327,000
Pennsylvania (2nd)	45,333	11,582,000
Tennessee (16th)	42,244	3,883,000
Ohio (17th)	41,222	10,305,000
Virginia (10th)	40,815	4,507,000
Kentucky (15th)	40,395	3,183,000
Indiana (19th)	36,291	4,918,000
Maine (23rd)	33,215	983,000
South Carolina (8th)	31,055	2,586,000
West Virginia (35th)	24,181	1,794,000
Maryland (7th)	10,577	3,613,000
Vermont (14th)	9,609	405,000
New Hampshire (9th)	9,304	681,000
Massachusetts (6th)	8,257	5,383,000
New Jersey (3rd)	7,836	6,898,000
Hawaii (50th)	6,421	718,000
Connecticut (5th)	5,009	2,875,000
Delaware (1st)	2,057	512,000
Rhode Island (13th)	1,214	898,000



UNITED STATES ARMED FORCES

Like almost all countries the United States has armed forces to defend it. These armed forces are made up of the Army, the Navy, and the Air Force. The Marine Corps is a part of the Navy. The Coast Guard becomes a part of the Navy in time of war. At the end of 1968, there were about 3½ million men and women in all the different branches of the armed forces together.

The president of the United States is the commander in chief of all the armed forces. Under him is the secretary of defense. The secretary of defense is a member of the president's cabinet. Under the secretary of defense are the secretaries of the Army, the Navy, and the Air Force.

The work of building up and training the armed forces of the United States is a very big one. The center of this work is in the great government office building in Washington called the Pentagon.

Many young men join the armed forces of their own free will. The government calls others into service. The Selective Service Act gives the government the right to do so.

To train young men to be officers in the Army, the government has the United States Military Academy at West Point, N.Y. The Navy has the United States Naval Academy at Annapolis, Md. The training school for Air Force officers is at Colorado Springs,

Colo. The one for Coast Guard officers is at New London, Conn. Most Marine officers are trained at Quantico, Va.

For many years the only women in the armed forces were nurses. Now there are women in all the branches. In World War II the WAC (Women's Army Corps), WAVES (Women Accepted for Volunteer Emergency Service—Navy), SPARS (Semper Paratus—the Coast Guard motto), and Women Marines were a great help. Now there are women in the Air Force (WAF). All have joined because they wished to.

The Army came into being officially in 1789. Soon afterward the Congress decided that 1,216 soldiers would be enough for it. Today there are more than a thousand times that many—over 1,500,000. Of this number about 165,000 are officers.

The Navy had its beginning in 1798. For the War of 1812, the Navy had 17 seagoing ships. Today it has over 900 commissioned ships. Naval officers number over 82,000 and enlisted men about 670,000.

There are some 300,000 Marines. Of them about 25,000 are officers. Ever since Revolutionary War days the Marines have been in the thick of every war.

The Air Force was not established until 1947. Before that time it was a branch of the Army. The Air Force today has some 15,000 active aircraft. There are about 138,000 officers and 760,000 enlisted men.

NAVY



Petty Officer Lieutenant in Dress Blues

COAST GUARD

AIR FORCE



Technical Sergeant

Each branch of the armed forces has its uniforms and insignia. The insignia for the Army, Air Force, and Marine officers are similar. And the insignia for both officers and enlisted men of the Coast Guard are like those of the Navy.

The strength of a country's armed forces does not depend entirely on the number of trained men and women in them. It depends also on their equipment. Besides the weapons used in battle, the United States has stores of missiles. Some are ICBM's (Intercontinental Ballistic Missiles) with nuclear warheads that can strike targets thousands of miles away. There are atomic bombs and shells, too. Planes and helicopters not only take part in fighting but also airlift troops and equipment. There are atomic-powered aircraft carriers and submarines. Such non-fighting ships as troopships and supply ships are equally important.

Of course maintaining the armed forces takes a great deal of money. It takes a big share of all the government spends.

The men and women of each branch of the armed forces take great pride in their own branch. Most boys and girls learn songs of the different branches. Some of the songs are: "Anchors Aweigh" (Navy), "The Caissons Go Rolling Along" (Army), "From the Halls of Montezuma" (Marine), and "Off We Go into the Wild Blue Yonder" (Air Force). (See ARMY; NAVY.)



WAC Corporal

Master Sergeant

ARMY



MARINES

Combat Uniform

Dress Blues

COAST GUARD

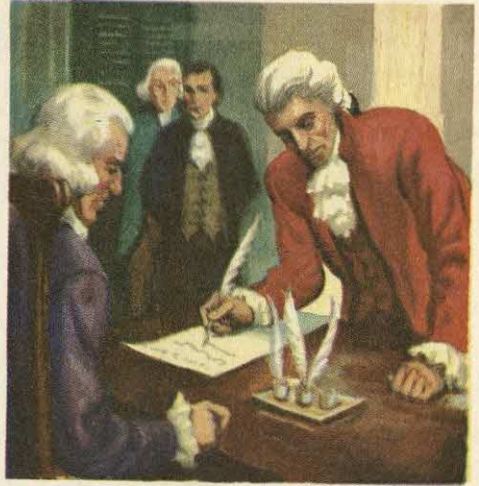
UNITED STATES CONSTITUTION In the National Archives Building in Washington, D.C., there are three pieces of parchment that belong to all of the people of the United States. They are among our most valuable possessions. So precious are they that they are sealed in glass cases filled with helium and are guarded at all times. One is the Declaration of Independence. Another is the Constitution. The third is the Bill of Rights, actually a part of the Constitution.

The Constitution is the plan for the government of the United States. It also protects the rights of each one of us. The Constitution proper is made up of seven sections, called articles. These articles state how the government of the United States is to be organized and run. The Bill of Rights is made up of ten additional sections, called amendments. There are now other amendments, too.

Our Constitution was not the first plan for governing the country. After the 13 colonies won their independence in 1783, they joined together as the United States of America. But they had no plan of government that worked. They had some rules called the Articles of Confederation. But these rules gave the central government little power. Most of the power was kept by the 13 separate states. Many problems arose that nobody could solve.

In May, 1787, some of the nation's most important men got together in Philadelphia. One of them was George Washington. He was made the head of the meeting, which was called the Constitutional Convention. Others at the meeting were Alexander Hamilton, James Madison, Benjamin Franklin, and Gouverneur Morris. Their idea was to change the Articles of Confederation so that the United States could get something done. Instead, they made an entirely new plan for the government, and set that plan down in the Constitution.

Once the Constitution was written, the states had to approve, or ratify, it. It was



Signing the Constitution

hard to get this approval. When a state ratified the Constitution, it had to give up some of its power to the central government. The states also feared that citizens would lose their hard-won liberty if the central government became powerful.

Nine states had to ratify the Constitution for it to go into effect. The ninth, New Hampshire, ratified it in June, 1788. By May, 1790, all 13 had ratified it.

When the states ratified the Constitution, they insisted that some amendments be added to protect the rights of the states and of individual citizens. These additions were written by the first U.S. Congress in 1789. They made up the Bill of Rights. Among other things, they guarantee freedom of religion, speech, and assembly, and the right to trial by jury.

Since the Bill of Rights the Constitution has been amended only 15 times. It is not easy to amend the Constitution. The United State Congress must first propose an amendment. Then three-fourths of the state governments must approve it. An example of an amendment is the 19th, ratified in 1920. It gave women the right to vote.

The Constitution provides for a plan of government with three divisions, or branches, with no one branch having too much power. The plan has worked well. It is the oldest written constitution now in use by any country in the world.



An Early Outdoor Court

UNITED STATES GOVERNMENT The United States is a democracy. Its people govern themselves through persons they elect to represent them.

The main offices of the United States government are in Washington, D.C., the country's capital. It has other offices scattered throughout the United States and foreign lands. It is, in fact, one of the world's largest organizations.

The government is made up of three branches—the legislative branch, the judicial branch, and the executive branch. The legislative branch makes laws. The judicial branch makes sure that the laws

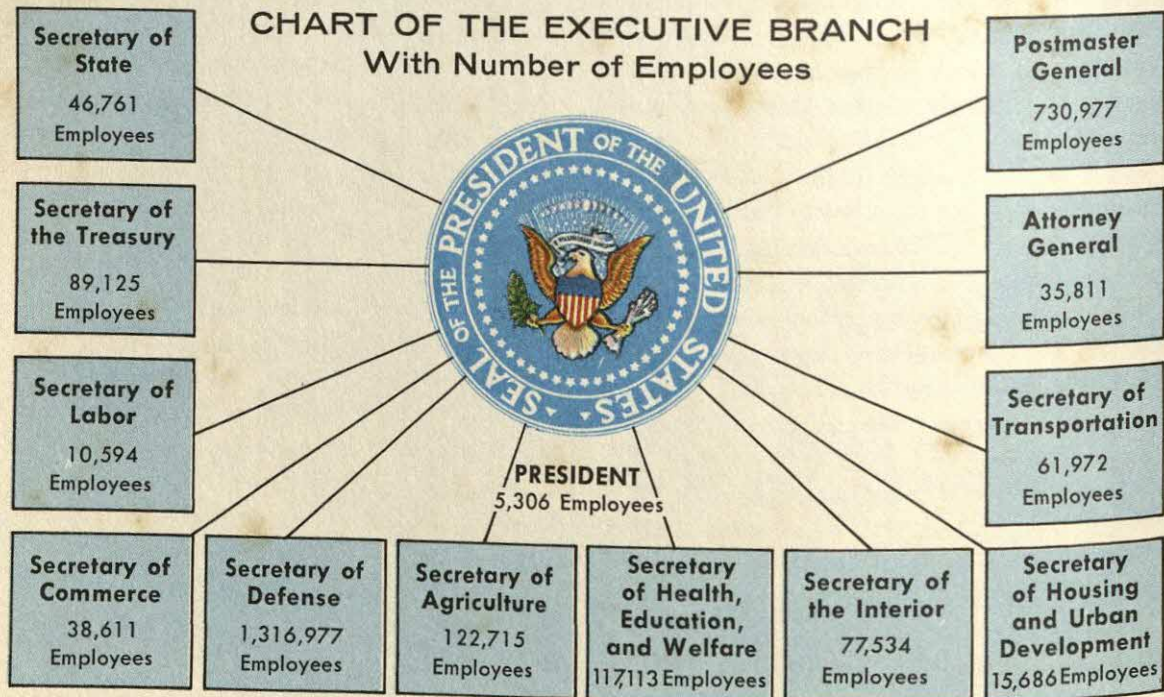
made agree with the United States Constitution. The executive branch is in charge of carrying out the laws. Each branch has some control over the other two. The country's founders wanted to keep any one of the branches from becoming too powerful.

The legislative branch is called the Congress. It is made up of two houses, the Senate and the House of Representatives. Both groups meet in the Capitol, a very large and impressive building.

The members of the Senate are called senators. There are two senators from each of the 50 states—100 in all. A senator is elected for a term of six years. He may be elected over and over again.

The 435 members of the House of Representatives are called representatives or congressmen. Although the members of both the Senate and the House are congressmen, the word "congressman" is usually used to mean a member of the House. All the states elect representatives, but the number each elects depends on its population. Alaska, for instance, has only one representative while New York has 41. A representative is elected for a two-year term and may be reelected any number of times.

CHART OF THE EXECUTIVE BRANCH With Number of Employees



A law, or bill, except one dealing with the raising of money, may start in either the Senate or the House. All money-raising bills must start in the House. Each bill goes first to a committee for study and possibly even for public hearings. If the committee approves the bill, it is sent before the entire body of the house of Congress where it started. If the members pass the bill, it must then take a trip through the other house of Congress.

A bill passed by both the House of Representatives and the Senate becomes a law unless the president vetoes it. Congress can, however, pass a bill over the president's veto by a two-thirds vote.

The Supreme Court, the head of the judicial branch of the government, is made up of the chief justice, or judge, and eight associate justices. The Supreme Court meets in a magnificent marble building that faces the Capitol. Above its entrance these words are carved: "Equal Justice under Law." The president of the United States appoints for life the justices of the Supreme Court. But the Senate must approve his choices. He also appoints the judges of the many federal courts scattered throughout the country. Most of the cases that come before the Supreme Court have been appealed from lower courts. Some of the cases are to test a new law passed by Congress.

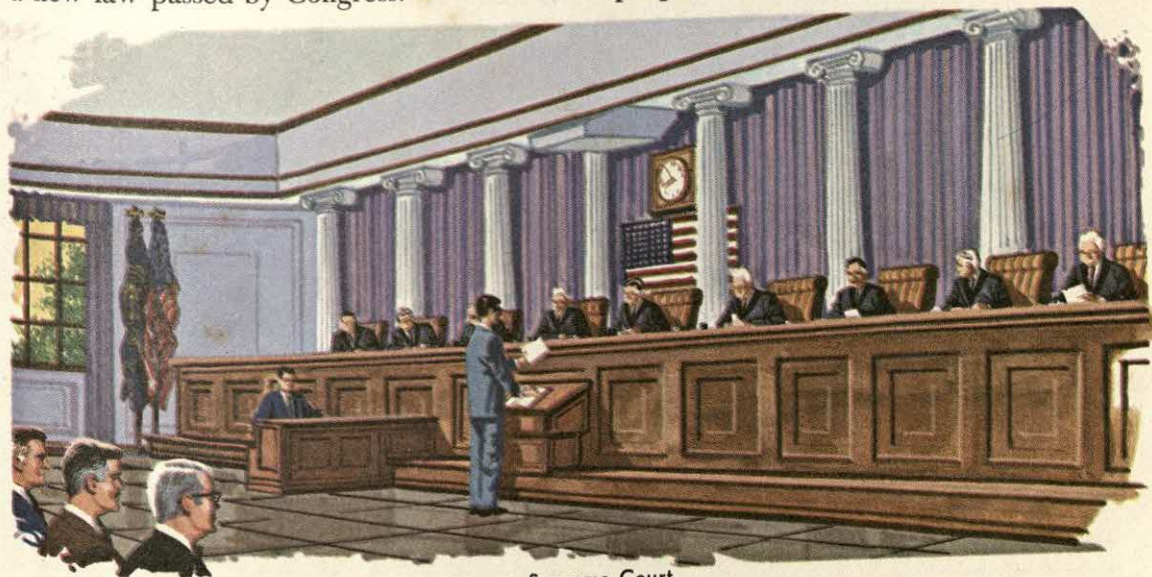
The president is the head of the executive branch of the government. He is also the commander in chief of the armed forces. The president, like the vice-president, is elected. The term of office is four years, and no president may be reelected more than once. If a president dies in office, the vice-president becomes president.

The people of the United States demand many services from their government, and the executive branch of the government is responsible for most of those services. Departments have been set up to carry them out. There are now the 12 departments the chart shows. The heads of the departments form the cabinet. The president appoints the members of his cabinet. Here again, as with the Supreme Court, his appointments must be approved by the Senate.

New departments are set up as there is need. Those of Housing and Urban Development (1965) and of Transportation (1966) are the newest two.

Besides the departments there are also a number of agencies. Among them are the Veterans Administration, the Atomic Energy Commission, and NASA (National Aeronautics and Space Administration).

As the United States has grown and changed, its federal government has clearly grown, too. But it continues to be "of the people, by the people, for the people."



Supreme Court

UNITED STATES HISTORY After Columbus reached the New World in 1492, many other European explorers came. Some were seeking gold. Some were adventurers. And some came to claim land for their rulers. In time settlers began coming to make their homes in America. Many of the settlers were from England. By the early 1700's there were 13 English colonies on the Atlantic seaboard of North America: New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, and Georgia. These 13 colonies became the original United States of America.

The colonists learned how to survive the hardships of the new land—how, for instance, to protect themselves from unfriendly Indians and how to deal with friendly ones. They learned how to make a living from the forests and the sea and the farmland they cleared. Here they had a freedom new to most of them—a freedom to worship as they chose. This freedom and the abundance of free land attracted other Europeans to the colonies—Germans, Scots, Irish, French, Italians, and others besides.

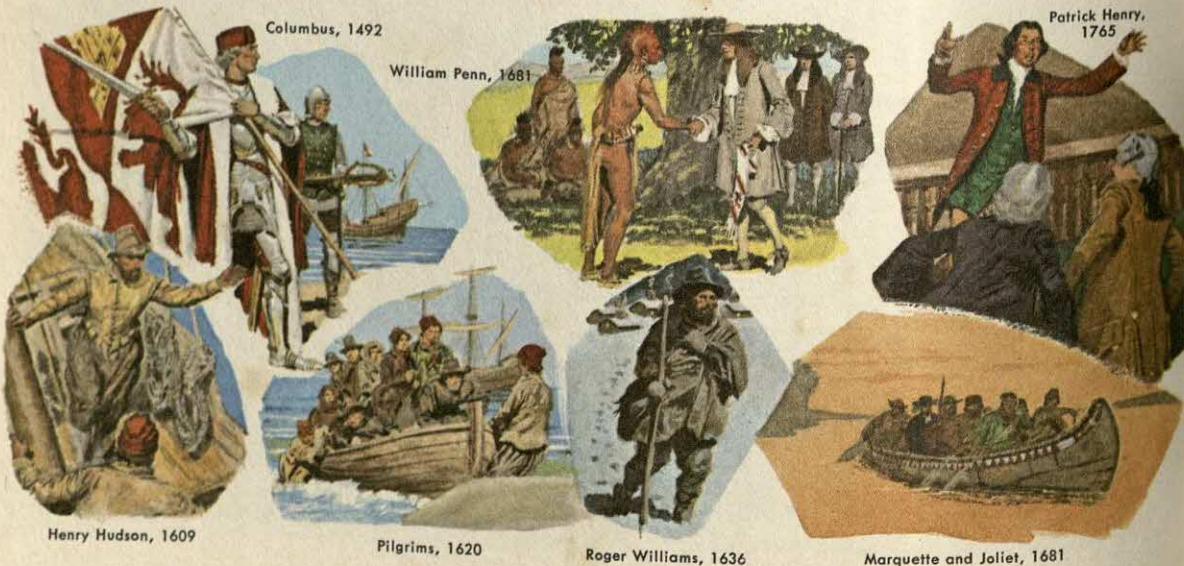
From the beginning the colonists had a big share in ruling themselves. But several of the colonies had governors who were appointed by the English king.

England was not a bad mother country for that time in world history. But colonists grew dissatisfied with her laws to limit the New World's trade with other countries. They resented, too, the taxes England made the colonies pay.

As the troubles with England grew more serious, representatives from the colonies met in 1774 in Philadelphia and made plans for fighting if that became necessary. In 1775 the Revolutionary War began with the Battle of Lexington and Concord. Soon George Washington was made commander in chief of the army. At first the colonists only wanted their grievances righted. But on July 4, 1776, they adopted the Declaration of Independence. It was more than six years before independence was won.

With the adoption of the Declaration of Independence the 13 colonies became 13 states. After the war, representatives of the states met in Philadelphia and wrote a constitution. It provided a strong national government. With a bill of rights added, all the states in time accepted it. In the first national election (1789), Washington was chosen president.

European nations looked down on young, poor, weak America. During a European war, Britain tried to keep American ships from carrying goods to British enemies. This brought on another American-British



war, the War of 1812. The United States defeated Britain a second time. Europeans began to respect the new nation.

Before the Declaration of Independence a few people had moved through the green barrier of the Appalachian Mountains to new homes beyond. After the War of 1812 this westward movement increased. People traveled on horseback, by riverboats, and in covered wagons. They settled in many kinds of western country.

In 1803 Thomas Jefferson, the third president, had bought an enormous piece of new land from France at a bargain price. This Louisiana Purchase pushed the boundary of the United States westward from the Mississippi River to the Rockies. It doubled the country's size.

Late in 1803 two young frontiersmen, Meriwether Lewis and William Clark, had been sent out at the head of a party to explore the West. They reached the Pacific. Their maps guided settlers to good lands.

In 1845 the United States annexed Texas, which had declared its independence from Mexico. This brought on the Mexican War.

New ways of traveling helped the pioneers. Steamboats and, later, railroads helped them move west and made it possible for them to trade with eastern cities. The discovery of gold in California in 1848 brought on a great rush to the West. Long

before the nation was 100 years old, American settlements spanned the continent.

The settlers on western lands had the right, under the Constitution, to form new states and to join the Union. This American-made right was the first of its kind in history. Rapidly new white stars were added to the blue field of the American flag.

The westward movement, however, increased one serious trouble. The northern and southern states in the eastern part of the country differed over an important question. The North did most of the manufacturing, employing free white workers. The South was farming country, using much slave labor. Southerners insisted that pioneers had the right to use slave labor in western lands. Northerners insisted on only free labor there. The disagreement steadily grew more bitter. Shortly after Abraham Lincoln took office as president in 1861, the South left the Union. The Civil War followed. The North fought to preserve the Union and won. All slaves became free.

American history is partly the story of useful inventions. Some of those made in the 1800's were of special help to farmers. The reaper, invented by Cyrus McCormick in 1834, speeded up the harvesting of grain. Steel plows, invented by John Deere in 1837, turned the soil, even tough prairie sod, and helped make possible larger and

Paul Revere, 1775

Revolutionary War,
1775-83Louisiana Purchase,
1803

Valley Forge, 1777/78

Washington's
Inauguration, 1789

Cotton Gin, 1793

Battle of Trenton, 1776



Burning of Washington, 1814

Erie Canal, 1825

Alamo, 1836

Lewis and Clark,
1803-7

Commodore Perry, 1813

Francis Scott Key, 1814

California Gold
Rush, 1849

Oregon Trail, 1846

larger farms. In the late 1800's tractors began furnishing power for many farm machines. Other inventions of the 19th century made life more comfortable. Among them were the telephone, electric lighting, and the automobile.

The cities of the United States have grown amazingly fast since colonial times. This growth came with the use, among other things, of three new sources of power—the steam engine, the gasoline engine, and the electric power plant. In early America most of the manufacturing had been done at home. The new forms of power hastened the building of factories, where goods could be turned out in greater amounts and at less cost. Americans found that they had great stores of coal, iron ore, and petroleum. The growth of transportation aided industrial cities, too. Goods made in the factories could be carried more and more easily as steamboats, trains, and trucks became common.

As manufacturing moved from farmhouses to city factories, workers in factories met new problems that arose from new ways of living. Many women and children worked in mills. Some of the children were less than ten years old. The working day was from sunup to sunset. The factory windows were usually small and dirty. This meant poor light and bad air. As factory

workers grew in numbers, they began to try to improve these conditions. In the middle 1800's national labor unions were formed. Unions have worked to end child labor in factories and to win better wages and better working conditions. They have helped to shorten the working day.

In earlier times only a few American children had a chance to go to school regularly. Free education for all was considered a dream. But such leaders as Thomas Jefferson, Benjamin Franklin, and Horace Mann worked to make this dream come true. One by one the states followed the good example of colonial Massachusetts: they built schools and supported them with tax money. "Little red schoolhouses" sprang up everywhere. After 1865 high schools were added to school systems. Larger schools took the place of the little red schoolhouses. School became more interesting. Children began to study not only the three R's but also many modern subjects.

A big "seed of liberty" that has grown with the years is the right to vote. In early America, in order to vote, men were required to own a certain amount of property. The pioneers were the first to extend the vote to other groups. They believed that all who shared the dangers and hardships of the frontier should share the same rights. In the new pioneer states all freemen 21

Fort Sumter, 1861

Lee's Surrender, 1865

Telephone, 1875

"Monitor" and
"Merrimac," 1862

Purchase of Alaska, 1867

Statue of Liberty,
1889

Custer's Last Stand, 1876

Sitting
Bull, 1890Emancipation
Proclamation, 1862

National League (Baseball), 1876

Sinking of the "Maine," 1898

years of age might vote. The older states in time followed their example. After the Civil War an amendment to the Constitution gave Negroes the vote. It was another 50 years and more, however, before women won the right to vote.

Within its first 100 years the United States grew to be a large, strong nation. During most of this time, the United States followed the advice of Washington to stay out of Europe's troubles. In 1823 President James Monroe warned Europe in the Monroe Doctrine not to interfere in the New World and promised that the United States would not interfere in Europe.

In 1898 the United States helped the Cubans win their independence from Spain. This war brought the United States Puerto Rico, the Philippines, and Guam. The Hawaiian Islands became a territory of the United States at about the same time. Alaska had been purchased from Russia in 1867. Hawaii and Alaska are now states, the 49th and 50th of the Union. The Philippine Islands were given their independence in 1946 and are now a republic.

The history of the United States in the 20th century is a story of great struggles, great problems, and great accomplishments. During the period, it fought in World War I and World War II. In the 1950's American troops went to the help of South Korea

when that small country was invaded by Communist North Korea. In the 1960's they again went to the help of a small Asian country—South Vietnam—when its government was in danger of being overthrown by Communists.

In science and invention the country has made remarkable strides. Early in the 1900's the Wright brothers flew the first airplane. Lindbergh made his historic solo flight across the Atlantic in 1927. The building of planes became a major industry. Now American factories make planes of all sizes and kinds, from small private planes to great airliners and military planes that can fly faster than sound.

The United States made the first atomic bomb and used it to end World War II. Since then it has been a leader in the peaceful uses of atomic energy.

In World War II Germany used long-range rocket missiles. After the war the United States began to develop such missiles. Along with rockets for missiles it also developed rockets for launching artificial satellites. The United States and the U.S.S.R. are the leaders in the space age. Hundreds of unmanned U.S. spacecraft have been sent up with missions to perform. More than a dozen manned satellites have been put in orbit. And the first men ever to escape from the earth and its gravity were the



three American astronauts who journeyed to the moon in 1968 aboard Apollo 8.

In both science and business, electronic computers have made possible much progress that could not have been made without them. Computers now do a great deal of the work that used to be done by people. Space exploration would be impossible without them.

Transportation and communication have kept pace with other advances. The country is covered with a vast network of highways. And many millions of radio and television sets help keep Americans closely in touch with the rest of the world.

Electronics, space exploring, and the uses of atomic energy have increased the need for trained workers. Colleges and universities have grown enormously.

One of the major problems today is the lack of equal opportunities for everyone. The 1960's brought many demonstrations by discontented groups. The crowding of cities and the growth of slum areas is another big problem. Overcrowding is blamed for occasional breakdowns of law and order. Poverty is a third big problem. In spite of the country's riches, not all its people are well fed and well housed. Still another problem is the waste of the country's natural riches. Many of its lakes and streams, for instance, and even the air itself in places, are badly polluted.

Much has been done to solve these giant problems, and much more is planned. Social Security, Medicare, and a Department of Housing and Urban Development are among the accomplishments.

The United States is recognized as one of the world's most powerful countries. It has done a great deal to help other lands. And one of its major interests is world peace. It helped organize and is a great supporter of the United Nations. (See CIVIL RIGHTS; COLONIAL LIFE; DECLARATION OF INDEPENDENCE; HISTORY; INVENTIONS; PIONEER LIFE; PRESIDENTS OF THE UNITED STATES.)

UNITED STATES POSTAL SERVICE

The United States postal service is one of the biggest businesses in the world. It employs over 750,000 workers. There are about 32,000 post offices. The Post Office Department handles more than 80 billion pieces of mail a year. Each year it takes in more than 5½ billion dollars.

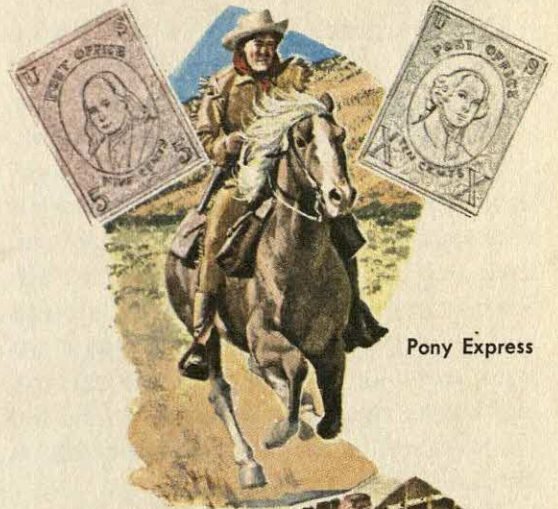
Handling billions of pieces of mail a year is an enormous amount of work. But the United States Post Office does more than that. It also issues money orders, a safe way to send money by mail. It has a COD service, too. A merchant can send by mail COD (collect on delivery) goods ordered from him.

The post office will handle a piece of mail in a special way if the sender wishes. A package sent by mail may be insured. The sender can collect its value if the package is lost or damaged. A letter or package may be registered. A careful record is kept of a registered letter or package by everyone who handles it. If it is mis-sent, it can easily be traced. A piece of mail may be certified. The sender is furnished with proof that it reached the right person. A letter or package may be sent airmail so that it will reach its destination quickly. It may be sent special delivery. In that case a messenger delivers it. A package may be marked for special handling. It will then be handled as quickly as if it were a letter. Of course, a person must pay extra for such services.

Not all the mail our postal service handles goes to places in America. Much mail is sent to other lands. Much comes from other lands, too. The United States belongs to the Universal Postal Union. Most of the countries of the world do. All the members of the Postal Union have agreements about exchanging mail with one another.

If we follow a letter through the mail we can get some idea of the amount of work it takes to handle the mail. Let us suppose our letter is for regular mail. The address will include a ZIP code number.

Each postal area in the United States has its own ZIP code number. First we drop the letter with the proper stamp on it in a mailbox. Soon a mail truck comes by and carries it to the post office. There a machine marks, or cancels, the stamp so that



Pony Express



Sorting Mail
in Mail Car



Delivering Mail

it cannot be used again. The letter is then put into a sack with other mail marked with the same ZIP code. The sacked mail is now off by land, sea, or air. The letter arrives at the right ZIP code area. There the mail is sorted, and our letter reaches a postman for delivery.

The postmaster general of the United States is in charge of the Post Office Department. The postmaster general is one of the members of the president's cabinet.

The idea of a postal service is not new. In ancient times many rulers had couriers who carried messages far and wide over their empires. But there was a great difference between the old courier systems and our postal service. The old courier systems were for the rulers of the country and not for the common people at all. Not one of them was everybody's servant, as the post office is today.

The United States Post Office had very small beginnings. In the early days of the colonies, letters were carried by travelers or peddlers. Among the best letter bearers were friendly Indians. Most of the letters from Europe were brought by ship captains. They took these letters to a tavern or coffeehouse. There the letters would stay until someone claimed them.

The first step toward a government post office was taken in Massachusetts in 1639. That colony appointed a man to take in letters from overseas. Later, the Dutch government of New Amsterdam, now New York, set up a letter box. The postage on each letter was paid in wampum. In 1672 a postrider was hired to carry mail once a month between New York and Boston.

In time the mail service in the colonies became part of the British Royal Post. But the Royal Post service was not good. The postriders did all sorts of errands along the way. A postrider might, for instance, be asked to deliver a yoke of oxen.

In 1753 Benjamin Franklin was appointed a joint postmaster general for the colonies. He hired more postriders. He introduced

stagecoaches to speed up the mails. But he was finally dismissed because he was on the side of the colonists in their quarrels with the English. When the colonies broke away from England they made Franklin postmaster general. The table tells some of the later steps in the story of the United States Post Office.

DATE	EVENT
1795	There were 453 post offices in the United States.
1799	Magazines were first accepted for the mail.
1825	A dead-letter office was established for letters that could not be delivered.
1834	Railroads first carried mail.
1845	Advertising was first accepted for the mail.
1847	The first stamps were issued.
1855	Letters were first registered.
1860	The pony express to and from the West was started.
1863	Free delivery service was begun in cities with populations of more than 50,000.
1864	Money orders were first issued.
1873	Postal cards were first placed on sale.
1874	The Universal Postal Union was set up.
1885	Special delivery service was begun.
1887	Free delivery service was started in cities of between 10,000 and 50,000.
1896	Rural free delivery service started.
1913	Parcel post, postal insurance, and COD services were begun.
1918	The first airmail was flown.
1925	Special-handling service was begun.
1927	Mail was first sent overseas by air.
1947	Helicopters were first used to carry mail between airports and post offices.
1948	Air parcel post started.
1955	Certified service was first available.
1963	ZIP code program was begun.
1964	The first 24-hour self-service post office was set up.
1965	The optical scanner, or ZIP code reader, was first used.

The workers for the Post Office take great pride in seeing that the mail goes through. Long ago a Greek wrote this about the couriers of King Xerxes of Persia: "Neither snow nor rain nor heat nor gloom of night stays these couriers from the swift completion of their appointed rounds." These words are carved on the front of the New York City Post Office. Many people think it is the motto of the whole United States postal service. It is not, but it well could be. Many postal workers have proved themselves heroes in trying to live up to it. (See PONY EXPRESS; STAMPS.)

UNITED STATES WEATHER BUREAU

In 1853 a bad storm over the Black Sea sank many French and British ships that were carrying supplies to soldiers fighting on the borders of that sea. "If only," people said, "there had been some way of knowing that a bad storm was coming." Just a year later a French scientist persuaded his government to set up a weather bureau for sending storm warnings to sailors before they left port.

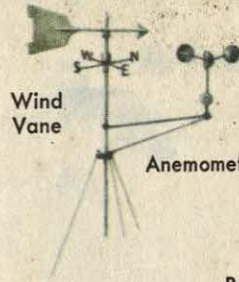
Soon after the French government started sending out storm warnings, one of the officers in the United States Navy began working hard to persuade his government to do the same thing. The officer was Matthew F. Maury, the man who helped find a good underwater path for the first Atlantic cable. In 1870 the government began sending storm warnings to sailors on the Great Lakes and along the Atlantic coast. The warnings were sent out by the Army Signal Corps.

Soon the government saw that sailors were not the only people who needed to know about the weather. In 1891 the U.S. Weather Bureau was set up under the Department of Agriculture. It moved in 1940 to the Department of Commerce. In 1965 it became a part of a new agency, ESSA (Environmental Science Services Administration). The main office is near Washington, D.C. But there are many weather stations over the country.

One of the chief jobs of a weatherman is to tell us what kind of weather we are going to have—how warm or cold it will be, whether it will be clear or cloudy, what the chances are of rain or snow, and what the winds will be. A weather map helps him make his predictions.

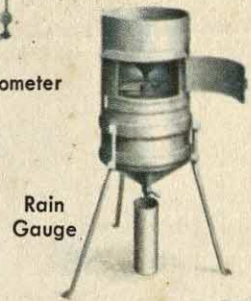
For many years a weather forecaster made a weather map by reading the weather instruments in his office and by getting by telegraph reports of the weather at other stations over the country. At every station there were barometers, thermometers, rain gauges, sunshine recorders, wind

WEATHER INSTRUMENTS



Wind Vane

Anemometer



Rain Gauge



Sunshine Duration Recorder



Mercury Barometer



Radiosonde Transmitter and Receiver



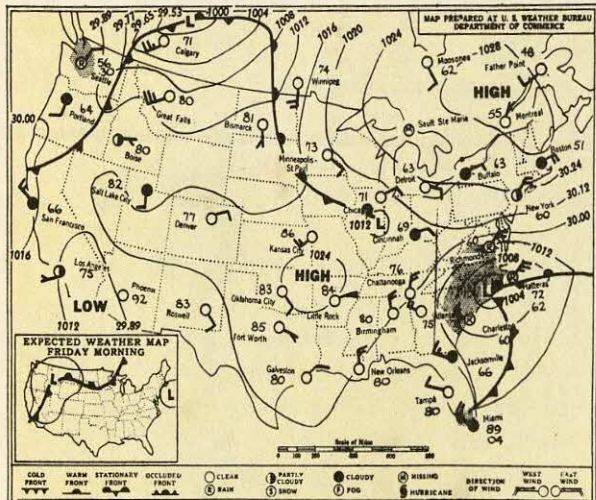
Aneroid Barometer



Recording Barometer, or Barograph

vanes, and anemometers for getting an accurate picture of the weather.

Then meteorologists—the scientists who study the weather—found that conditions high above the ground had much to do with the weather below. Weathermen began sending balloons aloft to find out about wind currents there. And electronics came



Weather Map

into the picture. Radar began to be used to track storms and to give word about the amount of rain or snow, if any. The radiosonde, too, was invented. It went aloft, often into the stratosphere, carrying weather instruments. Reports of temperature, humidity, and wind came down to the weather station below by radio.

More and more need was felt for forecasts that covered longer periods than a day or so. Long-range forecasts could not be made from knowing just about conditions in our country. The sending up of weather satellites helped get some of the needed information. The Weather Bureau has sent up Tiros, ESSA, and Nimbus satellites to get pictures of the earth's cloud cover.

The U.S.S.R. has sent up weather satellites, too. Since satellites travel around and around the earth, weather forecasting is now a world affair. Ships at sea and airplanes also report weather. An international code of weather signs is used.

Since so many reports come into the big weather stations, computers are now used to assemble the material and get the information needed for making maps and predictions. The computers are helping bring about more accurate forecasts.

Besides making the forecasts we are used to seeing and hearing, the weatherman makes special forecasts for pilots, farmers, and many other groups.

On cloudy days a pilot needs to know how high the clouds are. The weatherman tells him what the ceiling is—how high the base of the clouds is above the ground. Fog on landing fields is one of the dangers of flying. Thunderstorms and ice on the wings are two others. The weatherman warns fliers when there are fogs and thunderstorms ahead and when ice may form on wings.

As a help to the millions of motorists on our highways, the weatherman keeps track of the condition of the roads. He sends out word when the driving is hazardous.

The weatherman sends out warnings of frost and flood. In orange groves, where frost does a great deal of harm, small heaters can be started. Cranberry bogs can be flooded. Dikes can be made stronger and higher along a river if a flood is on the way. Horses and cattle and other livestock can be driven out of danger.

For fruitgrowers the weatherman makes fruit-spray forecasts. Fruitgrowers do not want to spray just before a rain, for the rain would wash the spray off.

In parts of the United States where there are forests the weatherman sends out warnings if there is danger of forest fires. If a big forest fire is raging, the weatherman may set up a small weather station in a truck near the fire to report to the fire fighters changes in wind direction.

One of the most important things the weatherman does for the people along the eastern and southern shores of the United States is to warn them of hurricanes.

Hurricanes do not strike the Great Lakes, but there are storms that may do damage to shipping. The weatherman warns the sailors about these storms. In the West he sends out warnings of blizzards that may harm livestock. In the parts of the country where tornadoes sometimes occur, he sends out word when to be on the lookout for them. Sending out storm warnings was the first weather work of the government and it is still very important.

Even if no storms are on the way, ship-pers often need the help of the weather-man. They may need to know what the temperatures will be along the shipping route. They will then know how they should pack their shipments.

The weatherman keeps careful records. An engineer who is planning new sewers for a city may need to know exactly how much rain fell in the city in the heaviest rain it ever had. A doctor may want to know exactly how dry the air is in some place so that he will know whether he should send a patient there. Weather records are often useful to lawyers. Sometimes there are lawsuits about damage done by bad weather.

The weatherman also helps the Department of Agriculture keep track of the crops. A crop report is put out every week. It truly seems that the weatherman "has a finger in every pie." (See WEATHER.)

UNIVERSAL LANGUAGES The world needs a language which everyone can understand. There would be, it is thought, more friendliness between nations if there were no language walls between them. We already have wonderful ways of sending messages. They have helped greatly in binding the world together. They would help more if there were a world language in which messages could be sent.

The idea of a world, or universal, language is not new. Many people have tried to work out such a language.

In 1879 a German priest named Johann Martin Schleyer invented a language called Volapük. Quarrels among the people trying to spread it ruined its chances.

A few years later L. L. Zamenhof, a Russian, invented a language planned for world-wide use. Such a language, he said, was the only hope of mankind. When he published his first book about his new language he signed himself Doktoro Esperanto. The name means "doctor who hopes." His language came to be called Esperanto.

Esperanto was not an altogether new language. It was built out of sounds and words found in the leading European languages of today. The following sentence is in Esperanto: *La popoloj faros en konsento uno grandan rondon familian*. The sentence says, "The peoples shall form in agreement one great family circle." Thousands of books have been translated into Esperanto, and many radio programs broadcast in it. Meetings are held to encourage its use. But it has not been as much of a success as was hoped. Ido, simplified from Esperanto, did not win favor.

Some people who have tried to make a world language have merely simplified a language already widely used. One of the simplified languages is Basic English.

Basic English is made up of 850 common English words. These words have been very carefully chosen. A six-year-old child who speaks English is likely to know at least 600 of the 850 words.

Here is a paragraph in Basic English from the story of Robinson Crusoe:

"Our ship," he says, "was of about one hundred and twenty tons. There were in the ship six guns, the chief, his boy, fourteen men, and myself. We had no goods with us other than playthings that were needed for our trade with the black men, such as neck ornaments, bits of glass, and things of little value—small looking glasses, knives, scissors, wood-cutting instruments, and so on."

No one expects that all the people of the world who do not speak English will give up their own languages and begin speaking Basic English. Basic English is meant to be simply a helping language. People will use their own language in talking with people of their own land. But perhaps they will use Basic English to get ideas across to the people of other lands. Some scholars think that there is more hope for Basic English than for any other universal language. (See LANGUAGES.)

UNIVERSE The universe includes everything. It includes the earth and everything on it. It also includes the solar system—the sun and its whole family of planets, asteroids, moons, comets, and meteors. It includes all the billions of stars in the same big star city with the sun—the star city we call the Milky Way Galaxy. It includes all the millions of other star cities.

No one knows how big the universe is. As better telescopes are made, we can see farther out into space, and the farther we look, the more star cities we can see. But we do know that the universe is so immense that any figures that might be given to try to show how big it is are beyond our imaginations.

If a person wanted to tell just where he was in the universe, he might write his address in some such way as this:

John Doe
1234 High Street
Butte, Montana 59701
United States of America
Earth
Solar System
Milky Way Galaxy
Universe

With telescopes, radio telescopes, and many other instruments astronomers are probing deeper and deeper into space. And the more they learn, the more they find there is to learn. Quasars, flickering in the deepest regions of space, and pulsars, sending out radio waves in pulses like our heartbeats, are among the new mysteries of the universe. (See **GALAXY**; **MILKY WAY**; **NEBULAS**; **STARS**.)

UNKNOWN SOLDIER If a soldier dies in battle, it may be that no one can tell who he is. He is then an unknown soldier. After World War I some of the countries that had fought together decided on a way to honor all their men who had lost their lives in the war. Each country would build a beautiful tomb over the grave of one of their unknown soldiers. Belgium, Britain, France, Italy, Portugal, and the United States all followed the plan.



The body of the American unknown soldier was taken to Arlington National Cemetery, near Washington, D.C. A beautiful tomb was built. On the tomb are these words: "Here rests in honored glory an American soldier known but to God."

In May, 1958, the bodies of two other unknown soldiers were placed next to the first unknown. They represent the men who died in World War II and the Korean War. The Tomb of the Unknown Soldier was then renamed the Tomb of the Unknowns. Night and day a soldier marches back and forth in front of the tomb as an honor guard.

URANIUM The silvery metal uranium was discovered in 1789. It was named for the planet Uranus, which had been discovered only a few years before. Uranium is very heavy—nearly twice as heavy as lead.

Uranium is not found pure. It is always joined with some other element or elements. As scientists say, it occurs only in compounds. The mineral pitchblende is made mostly of compounds of uranium.

Uranium was interesting to scientists when it was discovered. But no one guessed that, 160 years later, a hunt would be going on for it far and wide in the world. No one guessed that a discovery about it would bring on the age of atomic power. This discovery was that atoms of uranium can be split to give atomic energy.

An atom of an element is the smallest possible bit of that element. An atom of uranium is, therefore, the smallest possible

ORES OF URANIUM



Hunting for Uranium



Pitchblende



Uraninite

bit of uranium. Uranium atoms are very tiny. They are so tiny that it would take more than two billion billion to cover the period at the end of this sentence. But they are large as atoms go.

Scientists used to believe that no element could ever change to another. Now they know that this idea is wrong. Some elements gradually change to other elements. Uranium is one of them. It gradually changes to lead. As it does so, it gives off rays just as radium does. The word scientists use for an element that gives off rays in this way is "radioactive."

Scientists used to think that every atom of any element was like every other atom of that element. This idea, too, is wrong. Three different kinds of uranium atoms are found in nature. Uranium made of one kind of uranium atom is called U^{234} . Uranium made of another kind of atom is called U^{235} . Uranium made of the third kind is called U^{238} . U^{238} is the most common; U^{234} is the most rare.

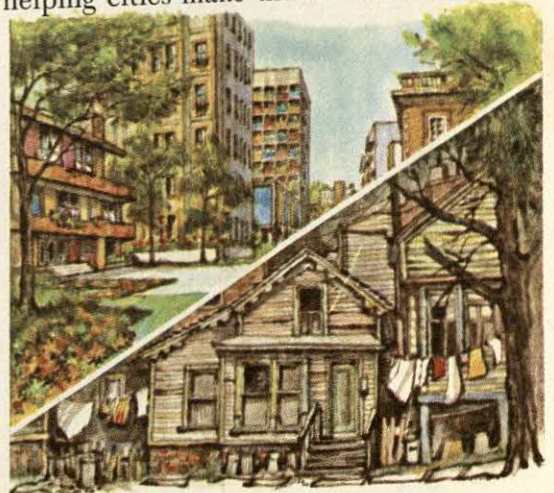
The differences between U^{234} , U^{235} , and U^{238} are very slight. All uranium looks alike. And under most conditions it acts just the same. But a tiny difference can be important. Scientists learned how to get atomic power by splitting atoms of uranium, but the atoms had to be atoms of U^{235} . The much more common U^{238} would not do. But in time scientists found out that they

could produce the element plutonium from U^{238} and that they could then split plutonium to get atomic power. All plutonium is man-made.

Uranium has helped scientists answer one question that they have been trying to answer for a long time: How old is the earth? The changing of uranium to lead gives a clue. Scientists know how fast uranium changes to lead. When they find in a rock some uranium and some lead formed from the uranium, they can tell, by seeing how much of each there is, how old the rock is. With the help of uranium, scientists have decided that the earth is from four to five billion years old! (See ATOMS; COMPOUNDS; ELEMENTS.)

URBAN RENEWAL This is the story of many a city: The city began before the days of automobiles. The streets were rather narrow. The city grew. More and more factories were built in it, and more and more people came there to live. Parts of the city became very crowded. The coming of automobiles added to the crowding. Many people who could afford to do so moved to the outskirts to get more space and cleaner air. The older sections were not taken care of. Some became slums.

Now urban, or city, renewal is under way. The problem is so big that in the United States the federal government is helping cities make themselves over.



URUGUAY This country of South America is the smallest independent country of the continent. It could fit into South Dakota with room to spare. Its nearest neighbors are the two biggest countries of South America—Argentina and Brazil.

Uruguay is not crowded. But it has four times as many people as South Dakota. Over half of its people live in the capital, Montevideo, and its suburbs. Montevideo is about the size of Houston. It is 20 times as large as Uruguay's next biggest city.

Montevideo is not far from the great city of Buenos Aires, the capital of Argentina. The two cities are separated by the Río de la Plata—the "river of silver." Boats go back and forth between them.

Many much larger countries would be proud to have Montevideo for a capital. It is a well-kept city with many beautiful buildings. It is famous for its beaches. If you were to visit the city, you might want to be there in December, when the beaches are opened for the summer. There is always a celebration. There is always a celebration, too, on the Day of Kings in January (Twelfth Night). This celebration is planned especially for the city's children.

Perhaps it seems strange that Montevideo opens its beaches in December. But it is south of the equator. It has summer when it is winter in the United States, and the other way around.

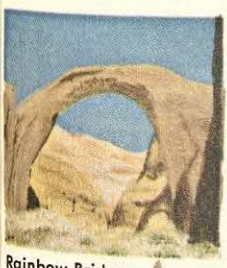
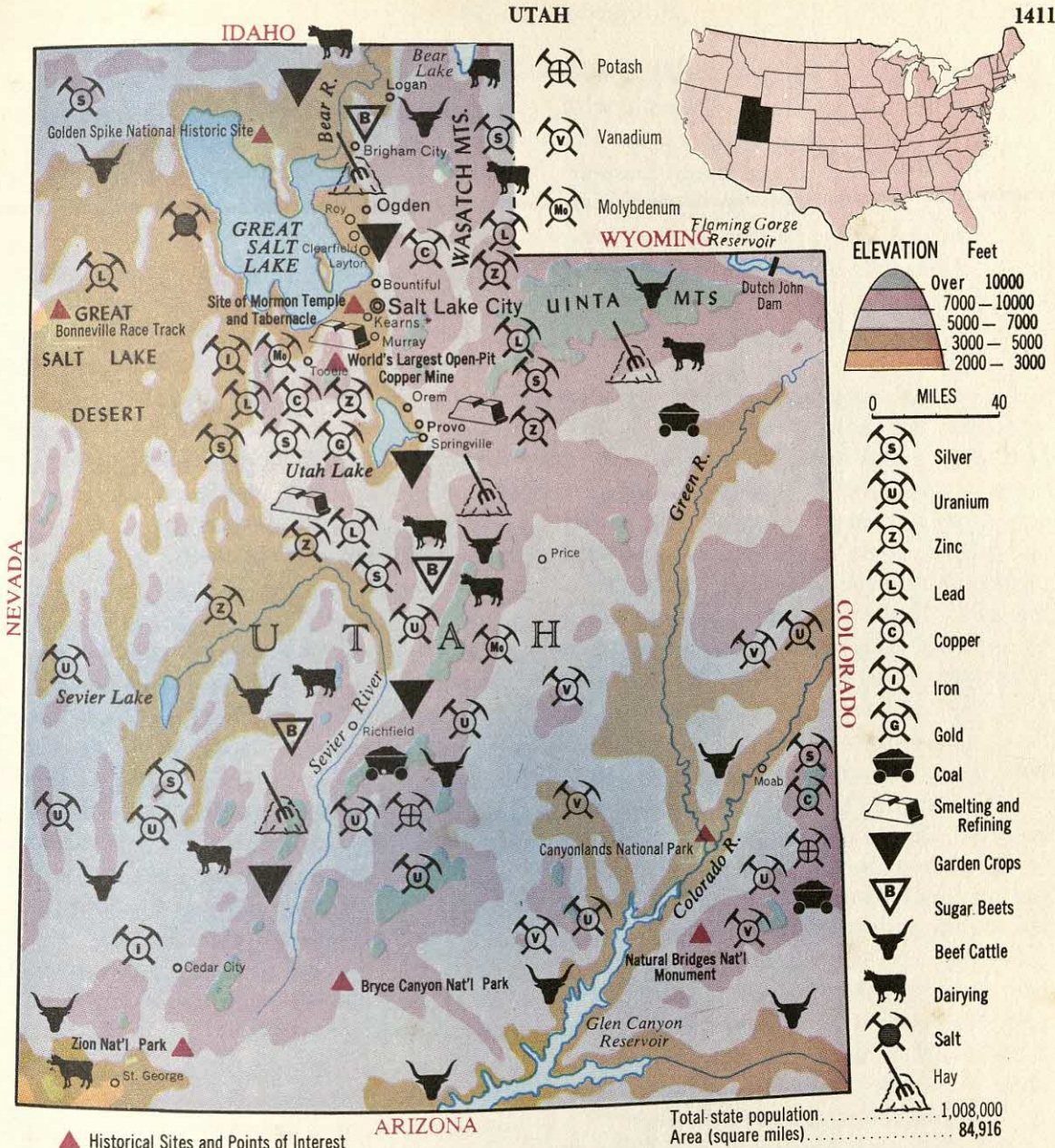
Away from the cities, Uruguay is mostly pastureland. About nine out of every ten acres of farmland are pasture. Much of the pasture is in big ranches, the rest in smaller farms. Sheep and cattle are raised on both. The sheep are raised chiefly for wool, the cattle for meat. The hides of the cattle are also important. The chief crops from the tenth of the land that is tilled are wheat, rice, corn, and flax.

Uruguay's farms and ranches produce more wool, meat, and hides than its people need. It has these products, therefore, to sell to other countries. It sells a great deal of flaxseed, too. With the money from these exports, the people of Uruguay can buy from other countries many things to make their lives more pleasant.

Montevideo can be reached by automobile, airplane, boat, or train. Big ocean ships are often at its wharves. Many of them are refrigerator ships. Before the days of refrigerator ships Uruguay had to dry or salt the meat it shipped across the sea. Now it chills or freezes it instead.

Most Uruguayans are descendants of European settlers. A great many of them are well educated. Nine out of every ten can read and write. In this way Uruguay is far ahead of some of the other countries of South America. (See ARGENTINA; BRAZIL; SOUTH AMERICA.)





Rainbow Bridge



Mormon Temple



State Bird:
California Gull

State Flower: Sego Lily

UTAH Until a little over a hundred years ago Indians were the only people who lived in what is now Utah. It is from the name of a group of these Indians, the Ute, which means "people of the mountains," that the state got its name. Utah is one of the Rocky Mountain states. In the east are the Wasatch and Uinta mountains and a high plateau cut by deep canyons and valleys. In the west is a part of the Great Basin, a dry region surrounded by high mountains. The first permanent white settlement in Utah was made by the Mormons in 1847.

Earlier the trapper James Bridger had seen Great Salt Lake, and John C. Frémont, with a party, had explored northern Utah. The Mormon settlers called the region Deseret, a word for honeybee from the Book of Mormon. The honeybee is a symbol of hard work, or industry. The Mormons worked hard in building up the "Beehive State." The state's motto is "Industry," its emblem a beehive.

In 1848, the second year of the Mormon settlement in Utah, it seemed as if their hard work might all be wasted. Swarms of crickets appeared and began eating the crops the Mormons had carefully planted and tended. Then, suddenly, a miracle happened. Out of the sky came thousands of sea gulls. The birds swooped down on the fields and gobbled up the crickets. That is why today in Salt Lake City there stands a monument to sea gulls. Plaques at the base of the 16-foot monument show sea gulls saving the crops of the early settlers.

Utah became the 45th state in the Union in 1896. Much of it is still thinly settled. In fact, for so large a state its population is very small. Two-thirds of all the people live in the cities, few of which are large. Salt Lake City, the capital and largest city, has about 190,000 people. Ogden is the only other city with a population of more than 50,000. Most of the cities are just to the west of the Wasatch Mountains. Most of the farms are in this section, too.

The Mormons brought water from the snowcapped mountains to make the sun-baked valleys fertile. They planned how to use the water for the good of the whole settlement. Their irrigated lands produced excellent crops. Summer temperatures are high enough to give a good growing season.

Government irrigation works have brought more water. There are now over a million acres of irrigated cropland. They produce hay, wheat, barley, sugar beets, fruits, and vegetables. There are also dairy farms in the fertile valleys. Livestock brings in more money than farm crops.

Today mining is more important than farming in Utah. The state is rich in copper, gold, silver, lead, uranium, and zinc. It has some of the best-known copper mines in North America. At Bingham Canyon, near Salt Lake City, electric shovels are biting away a mountain of copper ore. Dollarwise, Utah's oil is second only to its copper. Coal and iron mines support a thriving steel industry. Utah's factories are mainly for processing minerals and foods.

To the west of the lake is the Great Salt Lake Desert. The Bonneville Speedway, a natural automobile racing course, is here. World's speed records have been set on it.

In 1869 railroads from the east and the west came together in Utah to form the first cross-country railroad. The final spike in the railroad was made of gold. A monument now stands at the meeting place.

Utah has much magnificent scenery. There are breathtaking natural bridges and arches. Bryce Canyon, Zion, and Canyonlands national parks are desert areas of high-colored, deep-canyoned rock carved into shapes of fantastic beauty. Thousands of people visit them each year. Many of Utah's rocks are especially interesting because of their rich stores of fossils of dinosaurs and other animals of the past. (See GREAT SALT LAKE; MORMONS.)

UTOPIA More than 450 years ago an English writer, Sir Thomas More, wrote a book about an imaginary island. He called the island Utopia. In Utopia everyone who was able did his share of work. Everything raised or made was shared with everyone. No one was richer or poorer than his neighbor. A person could worship exactly as he pleased. There were almost no punishments and those that had to be were mild. Utopia was very different from the England in which More lived.

A great many people read about Utopia. To us now the word "utopia" often means a plan for living together that sounds wonderful but is not workable.



The letter V is one of the five letters that can be traced back to the single letter Υ in the Phoenician alphabet. The other letters are F, U, W, and Y. One of the two Greek letters that came from it had the forms Υ and ∇ . The Romans borrowed the tailless V-shaped form of this letter. At first the Latin V did not stand for a v sound. In some words it sounded like w and in some words like u. In time the v sound replaced the sound of w. Until late in the Middle Ages, when U became a separate letter, it had both u and v sounds.

In English words V stands for only one sound. *Very, vacation, and voice* all begin with it.

VACUUM A vacuum is an empty space. Most of the bowls and bottles and boxes we call empty are really full. They are full of air. To get a vacuum, even the air must be pumped out.

If all the air and everything else were pumped out of a container, there would be a perfect vacuum in the container. But no one has ever been able to get a perfect vacuum. It is possible, however, to pump out all but a very, very tiny bit of the air.

The vacuum pump in the picture is being used to pump the air out of a bell-shaped glass jar. The balloon inside the jar has a little air in it. As the air is pumped out of the jar the air inside the balloon makes the balloon get bigger.

The vacuum pump was invented about 300 years ago. Its inventor was the famous German scientist Otto von Guericke.

One reason scientists are eager to get to the moon is that they will have there an unlimited vacuum for experiments. (See GUERICKE, OTTO VON.)

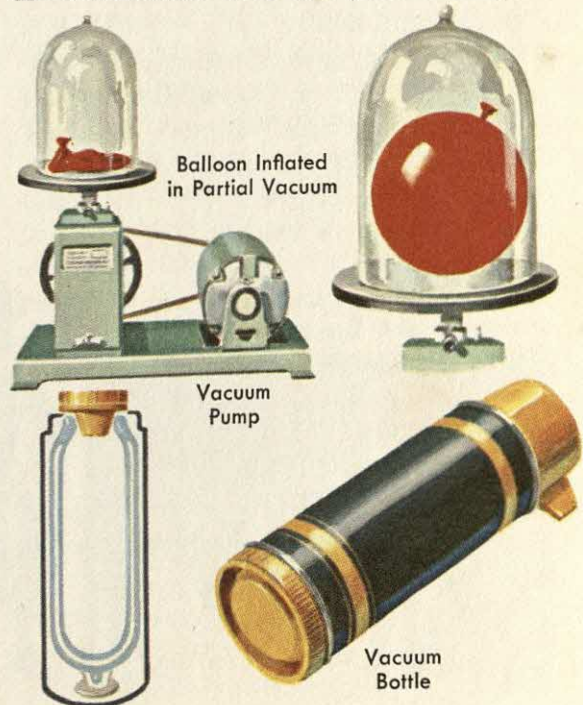
VACUUM BOTTLE A vacuum bottle is really three bottles in one. The two inner bottles are of silvered glass and are sealed together at the top. Most of the air has been pumped from between them so that there is an almost perfect vacuum there. The unbreakable outside bottle protects the other two.

If anything warm is put in a vacuum bottle, it stays warm for hours. If anything

cold is put in a vacuum bottle, it stays cold for hours. Heat cannot travel easily either in or out.

The vacuum between the walls helps shut the heat in or out. There is nothing to carry the heat across the space between the two bottles. The silver coating on the bottles helps, too. Rays of heat can travel even through empty space. But the silvered walls bend back rays of heat just as mirrors bend back rays of light.

A vacuum bottle is ruined if either bottle is cracked. Air forces its way in through the crack. Then there is no longer a vacuum to shut heat in or out. (See HEAT.)





VALENTINE'S DAY The holiday known as Valentine's Day comes on February 14 each year. It is sometimes called St. Valentine's Day, for it is the feast day of two saints who were both St. Valentine.

The idea of sending valentines on St. Valentine's Day had nothing to do with honoring either of the St. Valentines. No one knows where the idea came from.

VATICAN CITY There are several very small countries in Europe. Vatican City is the smallest. It covers only a little more than 100 acres. This tiny independent state is a country inside a city. For it is surrounded by the city of Rome.

The pope, the head of the Roman Catholic Church, lives in Vatican City and is its sovereign. The name Vatican City comes from the name of the pope's palace, the Vatican. The palace gets its name from the name of the hill on which it is built.

Basilica of St. Peter, near the Vatican in Vatican City



There are not many buildings besides the pope's palace in Vatican City. One of them is famous St. Peter's, the largest Christian church in the world. The great square in front of St. Peter's is within the boundaries of the tiny country.

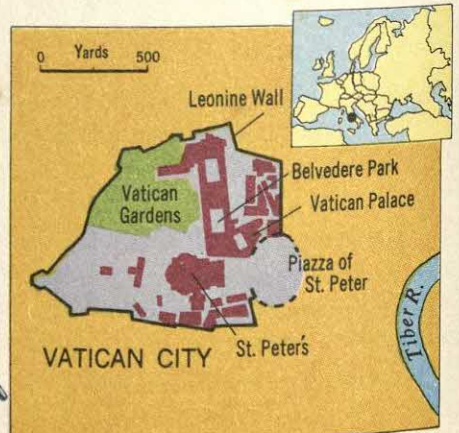
Only about 900 people live in Vatican City. On some days many times that many people visit it. On occasions when there are great processions, visitors see glittering spectacles of color and pomp unequaled anywhere else on earth. The uniforms of the Swiss Guard are supposed to have been designed by Michelangelo or Raphael.

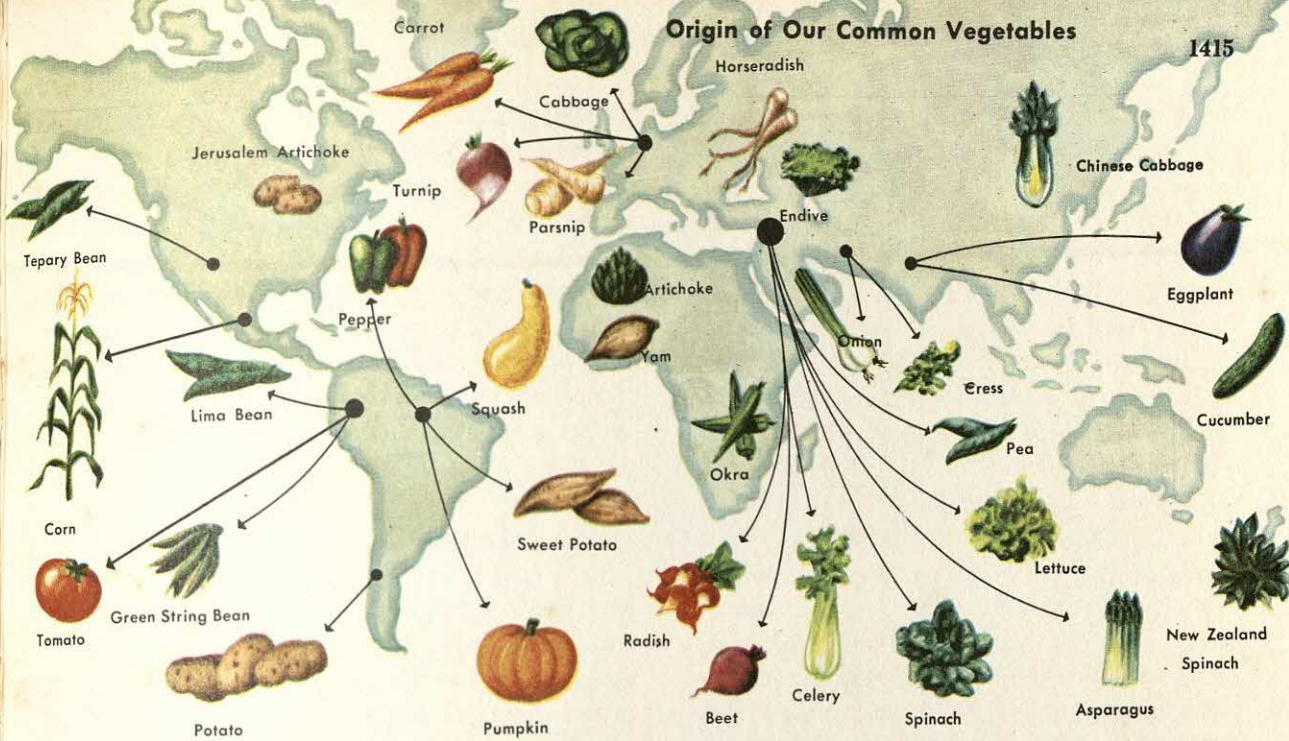
Although it is tiny, Vatican City has its own post office, railroad station, telephone system, and radio and television stations. It has its own flag, its own stamps, and its own newspaper. It even has its own money. (See CATHEDRALS; ROME.)

VEGETABLES Every vegetable we eat is a part of a plant. But not all vegetables are the same part. A vegetable may be the root, bulb, stem, leaves, or flowers. It may be the seeds. Or it may be the fruit—the part of the plant that contains the seeds. The table on the next page names some of our vegetables. In each case it tells what part or parts of the plant we eat.

Some of our vegetables still grow wild. There are still, for instance, wild carrots and wild parsnips. But the vegetables we raise are very different from those that grow wild. In the many hundreds of years people

Swiss Guard





have been raising vegetables they have improved them a great deal. Some vegetables never did grow wild. There never was any wild cauliflower, broccoli, kale, kohlrabi, or Brussels sprouts. All these vegetables have come from the cabbage plant since cabbage was first raised in gardens.

The vegetables in our gardens today came in the beginning from many different parts of the world. Tomatoes, potatoes, squashes, peppers, string beans, and lima beans are from South America. Celery, radishes, lettuce, peas, beets, spinach, and asparagus are

from the lands at the eastern end of the Mediterranean Sea. Europe gave us carrots, cabbage, turnips, and parsnips. From Africa came artichokes, okra, and yams. As their names tell, New Zealand spinach came from New Zealand and Chinese cabbage came from China. Cucumbers, eggplant, onions, and watercress are from southern Asia.

Our vegetable markets would certainly look strange if they had for sale only vegetables that are natives of North America. You may never have heard of the Jerusalem artichoke and the tepary bean. But you would know them well if vegetables had not been introduced from other lands. Corn is now popular around the world.

Doctors tell us that we should eat some vegetables every day. Vegetables have vitamins and minerals in them that we do not get enough of from other foods. Green vegetables, for instance, give us iron and vitamin A in them. Some vegetables are eaten cooked; others are better raw. A good plan is to eat every day two vegetables besides potato. At least one of the two should be raw. And at least one—it may be the same one—should be green or yellow. (See FOODS; PLANT FACTORIES; VITAMINS.)

Artichoke—flower buds	New Zealand spinach—leaves
Asparagus—young stems	Okra—seedpods
Bean—seeds and seedpods	Onion—bulb
Beet—root	Parsley—leaves
Broccoli—stems and flowers	Parsnip—root
Brussels sprouts—leaf buds	Pea—seeds and seedpods
Cabbage—leaves	Pepper—fruit
Carrot—root	Potato—underground stem
Cauliflower—flowers	Radish—root
Celery—leaf stalk	Rice—seeds
Chinese cabbage—leaves	Rutabaga—root
Corn—seeds	Spinach—leaves
Cucumber—fruit	Squash—fruit
Eggplant—fruit	Sweet potato—root
Endive—leaves	Swiss chard—leaves
Kale—leaves	Tomato—fruit
Kohlrabi—stem	Turnip—root
Lettuce—leaves	Watercress—leaves
Mustard—leaves	Yam—root

VENDING MACHINES The word "vending" means selling. Vending machines take the place of clerks and waitresses.

In English taverns as long ago as 1615 there were little vending machines for selling snuff. The customer put in a coin, a drawer full of snuff flew open, and the customer took a pinch. The first successful American vending machines appeared on New York's elevated train platforms in 1888. They sold chewing gum. Soon there were great numbers of machines for selling stamps, candy, gum, and cigarettes.

There are still small vending machines, but there are large ones, too. In many snack bars and cafeterias the walls are lined with them. Some food-vending setups have microwave ovens. A customer gets food from the vending machine—a casserole, let us say—puts it in the oven, punches a button, and in less than two minutes takes the food out well cooked.

In the United States the sales of vending machines amount to several billion dollars a year. These machines have become a part of the modern way of life.



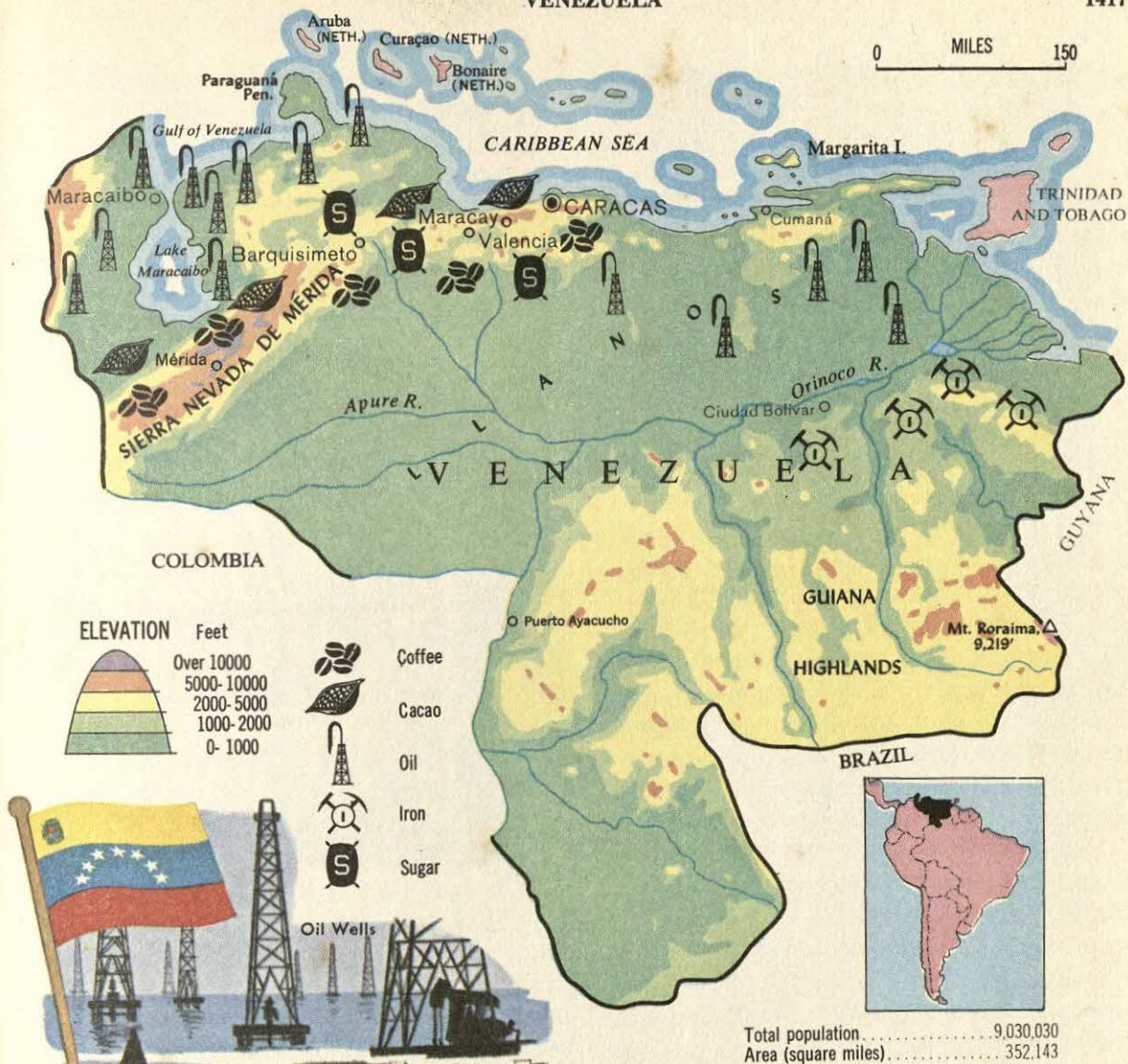
VENEZUELA This country of South America is on the northern coast. Its neighbors are Colombia, Brazil, and Guyana. Venezuela is a little larger than California, Washington, and Oregon together. But it has not much more than a third as many people as those states have. The population, however, has been growing very fast.

Venezuela is made up of two lowlands and two highlands. It is so near the equator that its lowlands are hot the year round. Even large parts of its highland regions are not high enough to be cool.

One lowland is around a big lake—Lake Maracaibo—and the Gulf of Venezuela, into which the lake empties. Not many years ago most of the few people of this lowland raised sheep or goats, or worked on cocoa plantations. Some were fishermen. Then oil was discovered. Oil wells sprang up everywhere—even out in the lake. Venezuela soon was one of the world's great oil-producing and oil-exporting countries. It now ranks third in producing and first in exporting oil. Maracaibo village grew into a big and flourishing port with paved streets, tall office buildings, and fine hotels and shops. Finding oil did not, of course, change the climate. But many of the city's buildings are air-conditioned.

One range of the Andes borders this lowland on the south and east and forms one of the highlands. This highland is the heart of Venezuela. Caracas, the capital, is in a broad valley in it. The city is near the Caribbean coast. Caracas is beautiful with its red roofs, colored plaster walls, and handsome new buildings. One of the sights of the city is the house where Simón Bolívar once lived. Bolívar helped many South American countries, including Venezuela, to win their freedom from Spain.

More than half the country's people live in the valleys of Caracas and nearby Valencia. Sugarcane, rice, beans, cocoa, and corn are raised there. Coffee is grown on many mountain slopes. Venezuela sells a great deal of coffee to other lands.



The second lowland is along the great Orinoco River. This river has built a large delta. The delta is covered with dense forest. Alligators sun themselves on the banks. Farther from the coast, great grass-covered plains called llanos stretch away from the river. Millions of cattle are raised on them.

The second highland covers all of the southeastern part of Venezuela. Much of this highland is not at all well known. Travel is hard. The land is rough and covered with heavy forest in which few people live. There are spectacular falls, among them Angel Falls, the highest waterfall in the world. Like the northwestern lowland, the region has important mineral riches.

Gold, diamonds, nickel, and manganese are among them. But most important is iron. It is now mined in mountains near the delta of the Orinoco. Recently part of this great river has been dredged so that oceangoing ships can come into it to be loaded with ore. Iron ranks next to oil among Venezuela's exports. (See SOUTH AMERICA.)

VENICE During much of the Middle Ages Venice, a city built on islands in a lagoon off the Adriatic Sea, was the queen of the Mediterranean. Venice's merchant ships traveled far and wide. Its merchant princes built fine palaces. The ruler of the city—the Doge—also had a splendid palace. Some of the great artists of the time—Titian and Tintoretto, for two—were Venetians. So was the famous traveler Marco Polo. Venice was known for its lovely glass.

Today this city of Italy is still an important Mediterranean port. It ships great quantities of goods that come to it from the mainland. But it no longer ranks first.

Waterways, or canals, between the islands serve the city as streets, just as they did long ago. All traffic is on foot or by boat. Among the boats are picturesque gondolas. Nearly 400 bridges cross the canals. The most famous are the Rialto and the Bridge of Sighs.

Bridge of Sighs



Tourists come to Venice by the thousands. They are interested in the magnificent palaces, the art, and world-famous St. Mark's Cathedral. Beautiful shops and the gondolas with their gondoliers are other attractions. Glass made in Venice is still prized. And every year there are many festivals. (See GLASS; MARCO POLO.)



VENTRILOQUISM When a person can make his voice sound as if it were coming from somewhere besides himself, we call him a ventriloquist. On television there are several famous ventriloquists. As a rule a ventriloquist has a doll, or dummy, in his act. He makes his voice seem to come from the dummy.

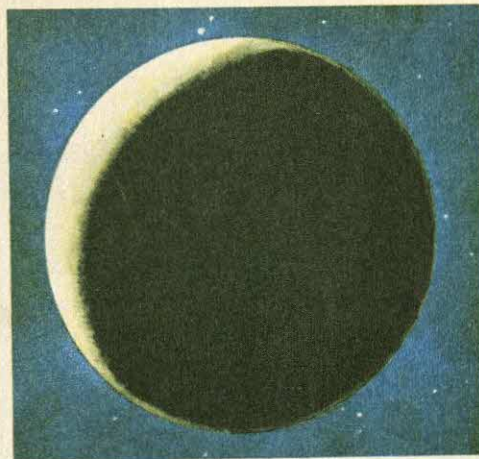
It takes a great deal of practice to be a good ventriloquist. A ventriloquist must talk without moving his lips. Words with "p" or "b" in them are especially hard because we have to move our lips in making those letters. A ventriloquist's "bite" sounds like "kite." A good ventriloquist helps to fool his audience by looking at the place from which the sound is supposed to be coming. The audience looks at the same place and away from the ventriloquist.

Ventriloquism is not new. It was known to the ancient Greeks. Many of them thought it was the work of demons.

VENUS Of the earth's eight sister planets, Venus comes closest to us. At times it is only about 25 million miles away. Venus is so nearly the same size as the earth that it is often called the earth's twin. Because its path is between the earth's path and the sun, this planet, when viewed through a telescope, seems to change shape just as the moon does. It has, in other words, phases like the moon's. Sometimes, as the picture at the right shows, it looks like a tiny new moon.

As seen in the night sky Venus is very bright—brighter than any star—because it has a dense cloud cover that reflects sunlight well. This cloud cover has helped make Venus a planet of mystery. It has made it hard for scientists to find answers to such questions as these: What is its surface like? How long is its day? How hot is it? Could living things like those on the earth possibly live there?

Now, with the wonders of electronics and space satellites, scientists are solving some of its mysteries. With radar they are mapping the surface and finding that it has what seem to be mountains and craters. They have found that Venus's day is longer than its year. In 1967 Russia's unmanned spacecraft Venus 4 dropped a capsule on Venus. Its instruments sent back reports.



Venus in Crescent Phase

They told that the atmosphere of Venus is almost entirely carbon dioxide, with almost no oxygen or water vapor, and that its "air" pressure is many times as great as the air pressure at the earth's surface. When the instruments stopped sending messages, they were reporting a temperature of over 500° F. The capsule may have been destroyed before it reached the surface of Venus.

Just one day after Venus 4 reached Venus, the United States spacecraft Mariner V flew by Venus at a distance of about 2,500 miles. As it did, it sent back reports. They agreed quite well with those from Venus 4.

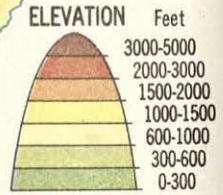
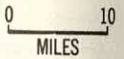
Early in 1969 more probes of Venus were on their way. In time Venus may no longer be mysterious. (See PLANETS.)



Venus has a cloud cover.



Even the night sky on Venus may be aglow.

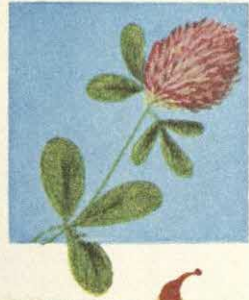


▲ Historical Sites and Points of Interest

Total state population 405,000
Area (square miles) 9,609

- | | |
|----------------|----------------|
| Dairying | Maple Syrup |
| Machinery | Fruit |
| Building Stone | Lumbering |
| Textiles | Paper and Pulp |
| Hardware | Hay |
| Asbestos | |

State Flower: Red Clover



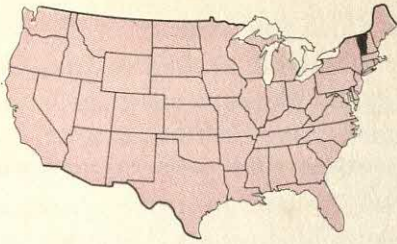
State Bird: Hermit Thrush



Maple Sugaring



Granite Quarry



VERMONT The only New England state without a seacoast is Vermont. It has been nicknamed the "Green Mountain State" for the Green Mountains, which run north and south through it. The name Vermont comes from the French words *verd mont*, meaning "green mountain."

Though small in size and in number of people, Vermont has given much to the United States. Vermonters are a proud and independent people, with great respect for the work of their forefathers. They are friendly and make strangers feel at home.

The story of the independent spirit of Vermonters begins before the Revolutionary War. Vermont was not a separate colony. Its land was claimed by both New Hampshire and New York. It was known as the New Hampshire grants. Men from the region organized a military group called the Green Mountain Boys to force the New Yorkers out. Before the disputes were settled, however, news came of the battle at Lexington. The Green Mountain Boys joined the American forces.

In 1777 Vermont declared its independence from England. But it did not become a state until 1791. It was the 14th state.

English-speaking people from other parts of New England were the first to develop Vermont. About 1850 large numbers of Irish came to build railroads, to work in factories, and to quarry rock. French Canadians came to the mill towns about 1860. A little later people from countries in central Europe came to work in the quarries.

In the past 100 years the population has not grown rapidly. The state is still far from crowded. Its neighbor to the south, Massachusetts, has 16 times as many people for every square mile. In Vermont there are only

four cities of over 10,000. The largest of the four is Burlington, with a population of about 36,000. Only two state capitals—Carson City, Nev., and Juneau, Alaska—are smaller than Vermont's, Montpelier. Almost two-thirds of Vermont's people live in very small towns or on farms.

Despite the small amount of level land, the thin rocky soil, and the short growing season, Vermont has many farms. Dairying is the leading farm work. Milk is shipped to Boston and New York. Some butter and cheese are made. Hay, apples, and potatoes are important crops.

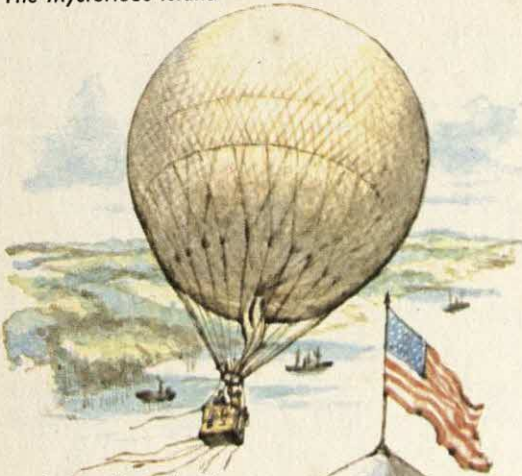
Vermont farms produce a special product—the famous Vermont maple syrup. Almost every farm has a sugar maple grove. From early March to the middle of April sugaring is the main interest of several thousand Vermont families.

The granite, marble, and slate quarries produce large amounts of building stone. Vermont's capitol at Montpelier is built of granite quarried in the state. Many handsome buildings are made partly of Vermont marble. Among them are the United Nations buildings in New York City. Almost all of the asbestos mined in the United States comes from Vermont.

The state has large paper and woolen mills. Other products of Vermont factories are machine tools, scales, and pipe organs.

It is as a vacationland that many people think of Vermont today. The cool summers are perfect for tramping the trails through the wooded mountains. The display of colors in the trees makes the autumn months beautiful. Winter snows attract skiers. The charm of a white church in a small town nestled in the tree-covered hills fills one with the quiet of New England. It is not surprising that many writers have written about the Vermont countryside.

Vermont's motto is "Freedom and unity." Its song is "Hail to Vermont." The sugar maple, of course, is the state tree. The state animal is the Morgan horse. (See HORSES; MAPLE SUGAR.)

The Mysterious Island*From the Earth to the Moon**A Voyage to the Center of the Earth*

VERNE, JULES (1828–1905) In 1958 an atomic submarine, the “Nautilus,” made history by sailing under the polar ice cap and crossing the North Pole. In a book written about 100 years earlier another “Nautilus” cruised under the ice cap at the South Pole. This earlier “Nautilus” was in *Twenty Thousand Leagues Under the Sea*, a book by Jules Verne.

Jules Verne was born in Nantes, France. As a boy he was interested in machinery, sailing, and writing. He and his brother Paul had an old sailboat in which they explored the river near their home.

The boys’ father was a lawyer, and Jules was sent to Paris to study law. Jules, however, soon decided that writing was his main interest. He joined a club of scientific writers. This group studied the balloon, and Jules wrote an adventure story which he called *Five Weeks in a Balloon*. Geography had been his favorite subject at school, and he wanted to describe as many different parts of the world as possible in his writings. The story about the balloon was supposed to be a description of Africa.

Verne is remembered and his books are still read partly because they are good adventure stories. But Verne also forecast many inventions that we have today. He believed that the world would someday have dirigibles, airplanes, submarines, television, long-range weapons, and spaceships.

Around the World in Eighty Days is one of Jules Verne’s most popular stories. When it first appeared, few of its readers believed that anyone would ever be able to do what Phileas Fogg, the hero, did in the story. The happenings in most of his books seemed just as impossible.

Verne kept in a notebook every idea or bit of information he came across that he thought might be useful in his writing. In his study he had a large map of the world on which he marked all the routes traveled by his heroes. When he died in Amiens, France, at the age of 77, he had written more than 50 books.

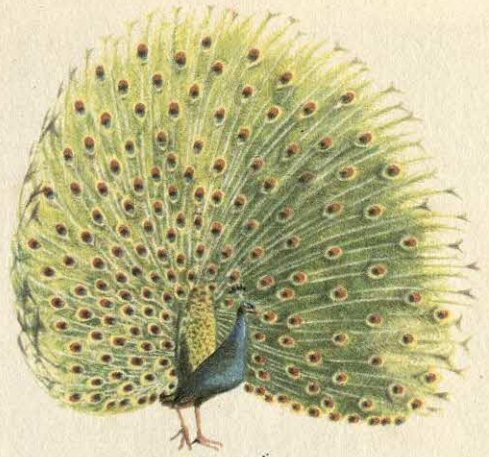
VERTEBRATES About one twentieth of all the kinds of animals in the world have backbones. The animals with backbones are called vertebrates. They get this name because their backbones are made up of small bones called vertebrae. The kinds of animals that do not have backbones are called invertebrates.

A vertebrate's backbone is a part of its skeleton. Not many other kinds of animals have skeletons inside their bodies.

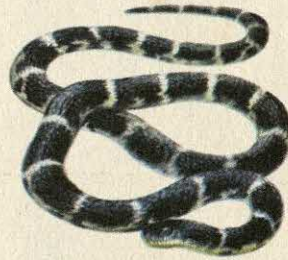
Every vertebrate has a nerve cord that is protected by its backbone. This nerve cord, which is connected to the animal's brain, is called the spinal cord. It runs along the animal's back.

The animals without backbones far outnumber the vertebrates. But the largest animals are vertebrates. So are most of the animals people know best.

The vertebrates are divided into five big groups. The five groups are the fishes, the amphibians, the reptiles, the birds, and the mammals. People are vertebrates. They are mammals. (See AMPHIBIANS; ANIMAL KINGDOM; BIRDS; BODY, HUMAN; FISHES; MAMMALS; REPTILES.)



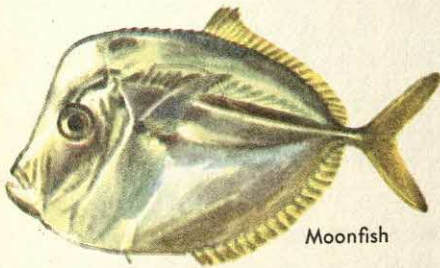
Peacock



King Snake



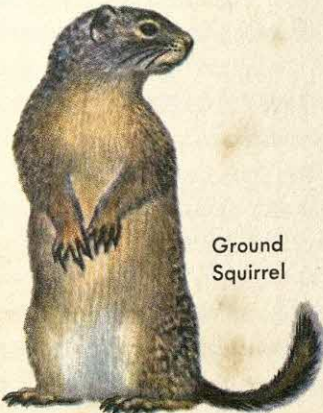
Spring Peeper



Moonfish



Moose



Ground Squirrel



VESUVIUS Probably the most famous of all the earth's volcanoes is Vesuvius, near Naples in Italy. Vesuvius is famous partly because, in A.D. 79, it buried the little Roman cities of Pompeii, Herculaneum, and Stabiae. For nearly 17 centuries the three cities lay buried and almost forgotten.

One of the people who watched this famous eruption was the Roman scientist Pliny the Elder. In his eagerness to help people escape and to see all that was happening, he ventured to Stabiae and was suffocated by the gases from the volcano.

A writer who lived 500 years after the famous eruption described Vesuvius as he saw it: "This mountain is steep and thick with woods below. Above, it is very craggy and wild. At the top is a deep cave. It seems to reach to the bottom of the mountain. If you peep in you can see fire. But this ordinarily keeps in and does not trouble the people. But sometimes the mountain belows like an ox. Soon after it casts out huge masses of cinders."

In the late 1500's workmen digging a canal near the foot of the mountain came across traces of a buried city. Digging to learn what was there, however, did not begin until 1748. Soon afterward the site was identified as Pompeii. Many treasures had already been unearthed from nearby Herculaneum, which had been discovered in 1709 during the digging of a well. Much of all three villages has now been uncovered.

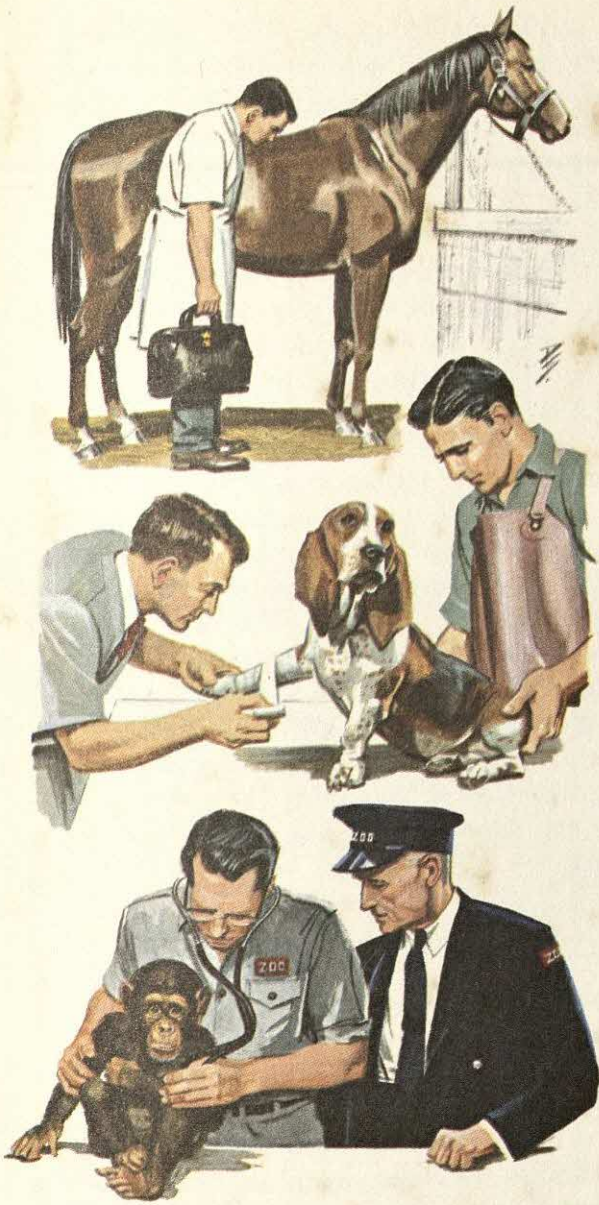
In modern times Vesuvius has erupted rather often. In 1906 there was an eruption that lasted 18 days. Great floods of lava poured out of the crater and out of cracks in the side of the mountain. Later enormous quantities of steam and other gases poured out. Still later tons of volcanic ash were thrown out of the crater.

In 1944, during World War II, there was another great eruption. A cable railway built to carry visitors to the top of the volcano was torn down, and the village of San Sebastiano was destroyed. Allied soldiers helped evacuate people in danger. (See ITALY; POMPEII; VOLCANO.)

VETERANS DAY On Nov. 11, 1918, the armistice ending World War I was signed. Thereafter Nov. 11 was set aside as a day for honoring the war's dead. At 11:00 A.M. people were to stop their work or play and stay silent for one minute.

In 1954 the name Armistice Day for Nov. 11 was changed to Veterans Day to honor all the men and women who have served in the United States armed forces. After 1970 Veterans Day, instead of being Nov. 11, will be the fourth Monday in October.

VETERINARY MEDICINE When we are sick, we go to a doctor. He may recommend going to the hospital. If one of our pets is sick, we may take it to an animal doctor, or veterinarian. He may advise putting the pet in the animal hospital so that it can be given the care and medicine it needs. Veterinary medicine is the treatment of animals by trained doctors.



Pet hospitals are now common. The veterinarian who operates one may have had special training in treating certain kinds of animals. There are, for instance, some veterinarians who treat only dogs.

Veterinarians are much more than just pet doctors. Veterinary medicine is very important to farmers and stock raisers. Farmers who raise hogs call in veterinarians to vaccinate their hogs to prevent a serious disease called cholera. Dairy cattle may have tuberculosis without appearing to be sick. Their milk is not safe to drink. Dairy

farmers call in veterinarians to test their cattle for tuberculosis. And, when farm animals are sick or injured, veterinarians are called in to treat or, if necessary, destroy them. Animals, especially chimps, are important in the space program. Veterinarians are needed to check the effects of space experiments on them.

Veterinary medicine is important in zoos, too. When Bushman, a famous gorilla of Chicago's Lincoln Park Zoo, was sick, several veterinarians were called in. When Mogul, an Indian rhinoceros in the Bronx Zoo in New York City, was found to have cataracts, the park veterinarian helped an eye doctor operate. Big zoos could not get along without their veterinarians.

Not all graduates of veterinary schools go into taking care of animals. There are other kinds of work their training prepares them for. Many veterinarians, for instance, are in the Department of Agriculture. There they do such things as inspect meat, enforce quarantine regulations, and prepare vaccines and medicines. Many work for dairies and pet-food companies.

VICTORIA (1819-1901) England in the past had two very famous queens. One was Elizabeth I, who ruled when the New World was being explored. The second was Victoria, who ruled 300 years later.

Victoria came to the throne when she was only 18. She ruled England and the British Empire for more than 60 years.

As a child Victoria did not dream that she would be the queen of England. She was a daughter of a younger brother of King George IV. There were uncles and cousins between her and the throne. But the other heirs died one by one. When William IV, who followed George IV, died, courtiers came in the middle of the night to tell Victoria that she was queen.

Victoria married her cousin Albert of Saxe-Coburg-Gotha. The marriage was a happy one. Their children and grandchildren were later on many European thrones.



Albert deserves part of the credit for Victoria's success as a queen. He helped her make decisions. Albert died suddenly when he and Victoria had been married for 20 years. Victoria grieved so much that many people thought she would never take any interest in her duties as queen again. But they were wrong. For 40 years more she ruled wisely with the help of two great statesmen. They were Benjamin Disraeli and William Gladstone. It has been said that no two statesmen could have loved each other less or England more.

In Victoria's reign the people she ruled were given more and more of a chance to help rule themselves. The British Empire, moreover, became more powerful than it had ever been before. The Suez Canal, of which Britain gained control, became a part of the lifeline that joined Britain with her lands overseas. When Queen Victoria died she had an extra title which no English ruler had ever had before. She was Empress of India. (See BRITISH COMMONWEALTH; ENGLAND'S HISTORY.)

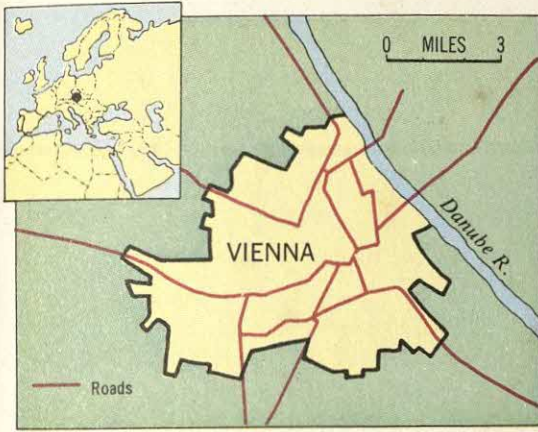
VICUÑA The vicuña lives above the tree line in the mountains of Peru and its neighboring countries. It has silky hair, somewhat like sheep's wool, out of which beautiful soft cloth can be made. The vicuña was the royal animal of the Incas, the Indians who built up an empire in South America several hundred years ago. Only the royal family could wear clothes made of its silky fleece. Today there are laws to protect the vicuña but they are often broken. The vicuña is a gentle animal, but it has never been domesticated. All the vicuña wool that is used comes from wild animals.

The vicuña belongs to the camel family. It looks more like the llama and the alpaca—other members of the family—than like the camel itself. It is smaller and more graceful than any of its close relatives.

VIENNA No other capital in Europe has more charm or a richer past than Vienna, the capital of Austria. Green woods, mountains, and the mighty Danube River give the city beautiful surroundings.

Vienna has more than 1,600,000 people. Almost one-fourth of all the people of Austria live there. Vienna is sometimes called a city without a country. It is so big that it does not seem to belong in so small a country as Austria.

To understand Vienna, one must know that it was once the capital of the large country of Austria-Hungary. It was a great center of trade. Two main highways had



met there since very early times. One was the east-west trade route of the Danube River. The other was an old road leading from the Baltic Sea to the Adriatic.

Vienna was a center of science and art and music, too. Many great composers lived there—Beethoven, Mozart, Haydn, Schubert, and Mahler. It had the name of being a very gay city, partly because of the dance music and operettas written by Viennese composers. The “Blue Danube,” one of the most famous of all waltzes, was written by Johann Strauss in Vienna.

After World War I Vienna found itself the capital of a rather poor country of less than 7,000,000 people. World War II made Vienna's lot even worse than it was before. Since 1955, however, Vienna has regained some of its former greatness. (See AUSTRIA; DANUBE RIVER.)

VIETNAM The Vietnamese can trace their history back for more than 20 centuries. For many of those centuries Vietnam, their homeland in southeastern Asia, was independent. At other times it was ruled by other nations. When World War II began, it was a part of French Indochina. At the end of that war the Vietnamese began fighting to win their freedom. Many of them were Communists who wanted Vietnam to be a Communist country. In 1954 Vietnam won its independence. It was then divided into North Vietnam, a Communist nation, and South Vietnam, a free republic.

In 1959 the Viet Cong, made up of Communists from both Vietnams, began by



guerilla warfare to try to gain control of South Vietnam. The United States and several other countries came to the help of South Vietnam, and North Vietnam to the help of the Viet Cong. At the beginning of 1969 the fighting was still going on.

The two Vietnams are almost the same size and have about the same number of people. In each there are mountains and dense forests. And in each there are lowlands where millions of rice farmers live. Both Vietnams are among the world's great rice-producing lands. Rubber is South Vietnam's chief export. North Vietnam is rich in coal and other minerals.

North Vietnam's capital, Hanoi, is a city of over 500,000. Saigon, South Vietnam's capital, is several times as big and is one of the great cities of Asia.

VIKINGS A thousand years ago the Vikings lived in northern Europe. Their home was Scandinavia, where the countries of Norway, Sweden, and Denmark are now. The Vikings were the ancestors of today's Norwegians, Swedes, and Danes. Northmen and Norsemen are other names that are often used for the Vikings.

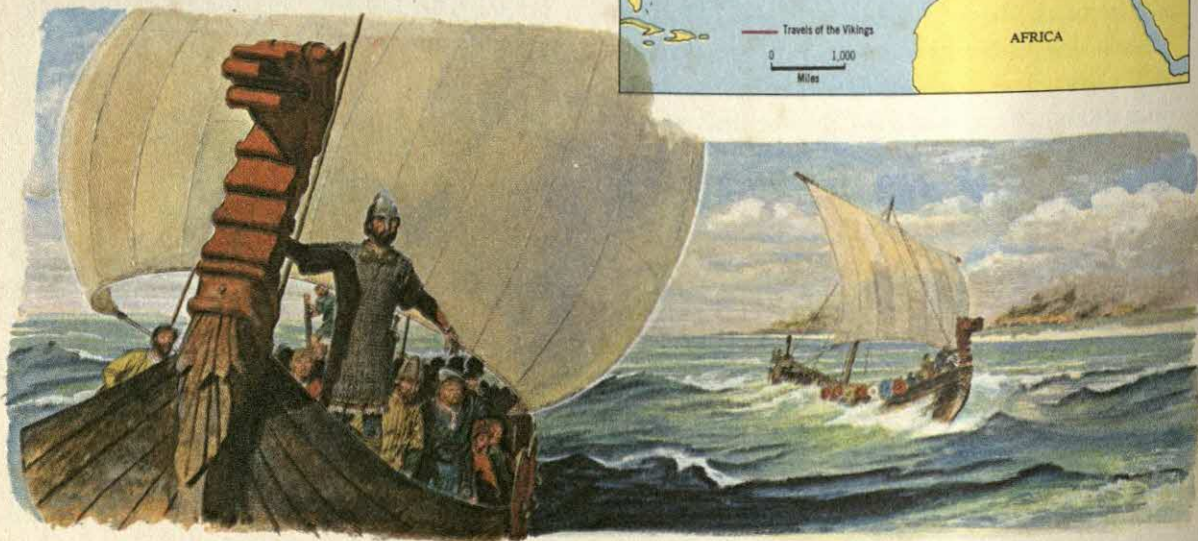
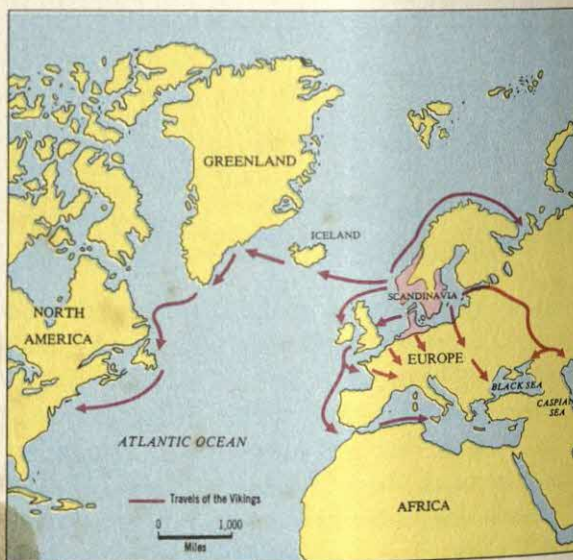
Their homeland was cold. Part of it was mountainous. It had long, long coastlines. Along much of the coast there were many narrow bays, or fiords. Since they lived so

near the water, it is not strange that most of the Vikings went to sea. The seas near their homeland swarmed with their boats.

The Vikings were raiders and pirates. From their plundering along the coasts of other lands they brought back boatloads of gold, silver, and other priceless booty. They even brought back slaves. Their slaves were called thralls.

The Vikings were also traders. They loaded their boats with such things as dried fish and furs to sell at trading posts they set up in neighboring lands.

Viking fighting ships had sails, but they also had oars for getting about in streams and close to shore. The boats had flat bottoms and were easily beached. The stern and prow were high and curved. Often the prow was carved into a dragon or snake.





Vikings reached the New World.

Along the sides of their boats the Vikings hung their round, painted shields.

A Viking chief thought so much of his boat that he often had it buried with him. His horses and dogs and much of his treasure were often buried with him, too. Treasures from many faraway parts of the world have been found in Viking graves.

The Vikings were bold warriors. They believed that it was much better to die in battle than to die at home. They fought so hard that they were the terror of their neighbors. Sometimes they even fought among themselves.

From their homeland the Vikings spread out to many places. Some went to England to live, some went to Russia, and some went to northern France. Some found the island of Ireland and settled there. Some settled in Iceland and in faraway Greenland. Leif the Lucky was one of those in Greenland. He reached the American mainland long before Columbus arrived in the New World. For a time there was even a Norse colony on the coast of Labrador.

The Vikings had good ideas about how to govern themselves. They had village councils. Through these councils they made their own laws.

Even the Viking chieftains lived simply. Their houses were made of logs. There was one big room in each house. The floors were dirt. In the center of the floor there was an open fire. Smoke went out through

a hole in the roof. The only windows were in the roof. They were covered with thin skin. Many Viking houses had no furniture except tables and benches. The benches were both chairs and beds. Viking food was mostly fish. Ale was a common drink.

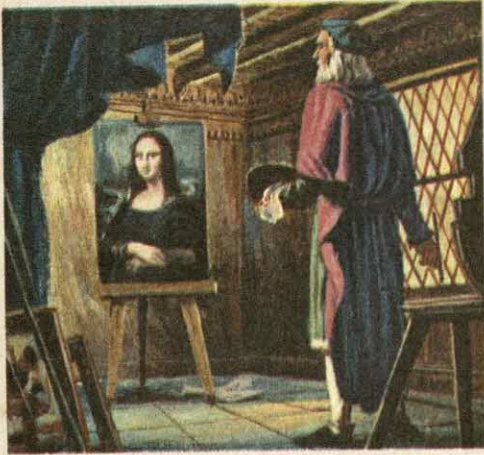
The Vikings had not come very far up the long road to civilization. But they could write. The kind of writing they used is called runic. Their alphabet had only 16 letters in it. They were shaped so that they could be carved on stone easily.

For two or three hundred years the Vikings did not write much about their adventures. Instead their minstrels sang about them. Chieftains had minstrels who sang to them and their guests on long winter evenings. Later the stories were written down. These stories are called sagas. If it were not for the sagas, no one would know much about these bold seamen of the north. (See ALFRED THE GREAT; BOATS; COMPASS; DENMARK; GREENLAND; ICELAND; LEIF THE LUCKY.)

VINCI, LEONARDO DA (1452-1519)

Everyone agrees that Leonardo da Vinci was one of the greatest of all painters. His painting "The Last Supper" is probably the most famous painting in the world. But Leonardo would be famous if he had never painted a stroke. For he was also a great inventor. He invented the wheelbarrow, the military tank, and roller bearings. He made plans for dozens of weapons and machines. He even experimented with airplane and submarine models. Besides, Leonardo was great as a scientist and engineer. He was also a poet, a musician, and a sculptor. Perhaps no other person in history has ever learned so much in a lifetime. Certainly no one ever deserved more to be called a genius.

Leonardo was born in the village of Vinci in Italy. As a small boy he lived most of the time with his father's parents. Their home was large, and they had many servants. Leonardo was a beautiful boy with



Leonardo Painting the "Mona Lisa"

curly hair and bright-blue eyes. When he was 13, he went to Florence to live with his father and a houseful of half-brothers and sisters. When his father found out that the boy was interested in painting, he sent him to Verrocchio, an excellent painter and sculptor. One day, it is told, Leonardo painted an angel in one of Verrocchio's pictures. Verrocchio on seeing it said, "You are a greater painter than I. I will paint no more. I will work at my sculpture."

In a few years Leonardo's father decided that he would pay no more to Verrocchio. His son, he thought, was spending too

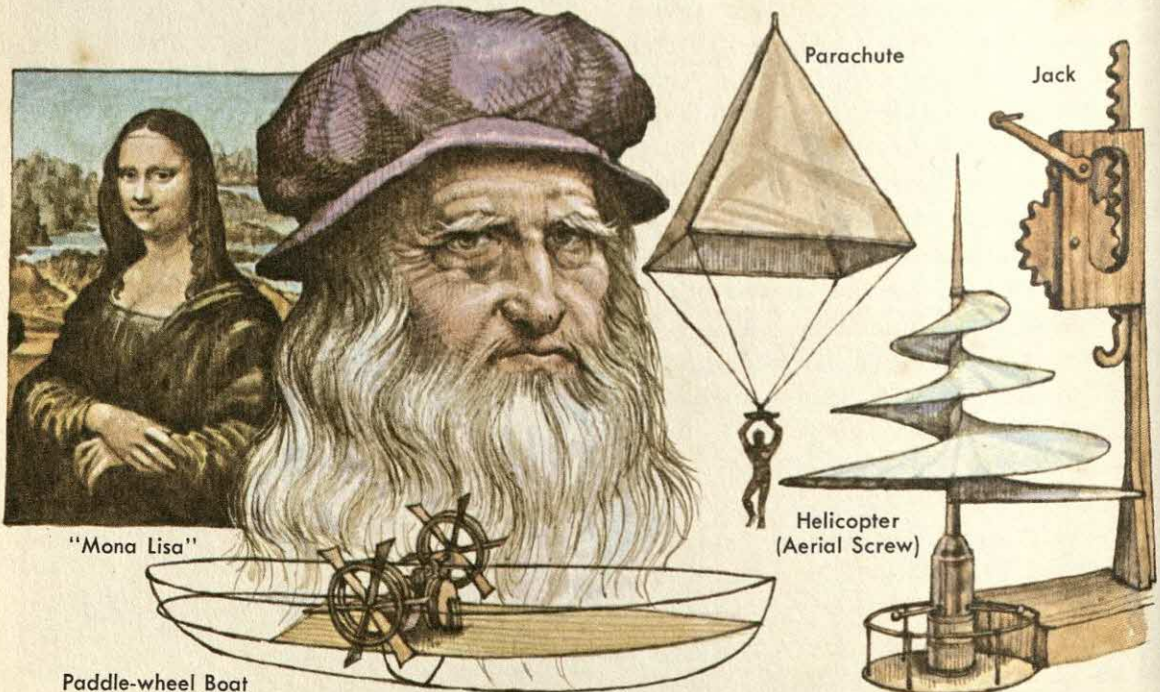
much time studying rocks and plants, watching birds to find out how their bodies work, and building models of machines. But Leonardo stayed on as Verrocchio's helper. He stayed till he was nearly 25. Then he set out for himself, first in Florence, then in Milan and Venice, and at the end of his life in France.

Leonardo had ideas that other painters liked to copy. "Let them," he said. "I will originate. They can copy."

This great painter left behind only a few paintings. He had many ideas for pictures and made many wonderful pen-and-ink and chalk drawings. But he had so many other interests that he found it hard to sit and paint for hours at a time.

Some of his paintings have been lost because he liked to experiment. He used colors mixed with wax to paint a wonderful mural of a cavalry battle, but the wax melted and the picture was ruined.

"The Last Supper" is on the wall of a chapel in Milan. It was painted on wet plaster in the kind of paint called tempera. This picture was famous long before it was finished. There was great rejoicing the day it was done. Within 20 years, however, the



"Mona Lisa"

Paddle-wheel Boat

picture had begun to fade. Only a ghost of Leonardo's painting is left now.

There is such beauty in Leonardo's pictures that they are as hard to describe as beautiful music. The faces of his people are full of expression. He used light and shade in a new way to make people look very lifelike. He made some of the backgrounds in his pictures look misty and far away.

One of Leonardo's few paintings, the "Mona Lisa," is the picture of a woman with a faint smile on her face. The painting was ordered by the woman's husband. But Leonardo liked it so much that he kept it for himself. He took it to France with him when he went to spend the last years of his life as court painter to the king of France. Now it is one of the greatest treasures of the Louvre in Paris. (See PAINTERS AND PAINTING; RENAISSANCE.)

VINES A morning-glory plant is a vine. It must have something to climb on to get its leaves up into the sunshine. Its stem is not strong enough to hold them up.

There are many different kinds of vines. They all have long, weak stems. But they do not all climb. Some, like the pumpkin, creep over the ground. Some, like many blackberries, scramble over other plants surrounding them.

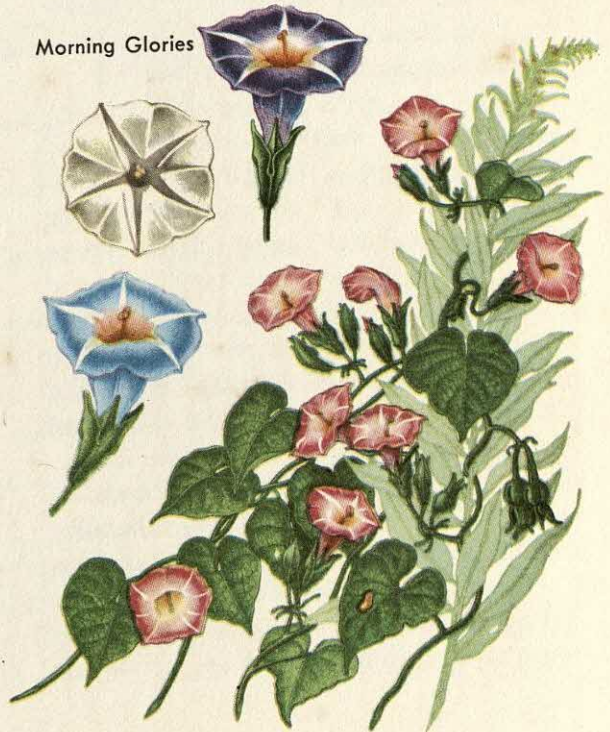
The vines that climb have different ways of climbing. The stems of some twine around a stake, cord, another plant, or something else that will act as a support. The morning glory is a twiner. The nasturtium twines its leafstalks, not its stems, around a support. Sweet peas, vetches, and grapevines are among the many plants that have tendrils that twine. The tendrils of Virginia creeper and a number of other vines have little sticky pads at the ends. English ivy is a root climber. Along its stem it has small roots which it sends into tiny cracks in walls. They hold on so tight that it is hard to pull the ivy away from the wall. Climbing vines are especially common in tropical rain forests.



Common Vetch

Some vines are a nuisance. To farmers bindweed is a bad weed. Poison ivy and dodder are more than a nuisance. Dodder usually kills the plants it grows on, because it steals food from them. But some vines help us make our homes beautiful. And many are important food plants.

Morning Glories



VIRGINIA The colony of Virginia was named in honor of Elizabeth I of England, the "Virgin Queen." It became the 10th state of the United States.

This southern state attracts many visitors. In the summer of 1957 more thousands than usual poured into it. They came to help celebrate the 350th anniversary of the founding of Jamestown. Jamestown was the first lasting English settlement to be established in America.

Jamestown was a little village on the James River. It lasted nearly 100 years. In time marsh grass and bushes grew over its gravestones and the ruins of its buildings. Some 40 years ago government explorers dug up the ground and found farm tools, kitchen utensils, and foundations of old buildings. These and other relics are now on exhibition for visitors to see. At the site there are replicas of buildings of the 17th century and of the three ships that carried the first settlers there.

Only a few miles from Jamestown is Williamsburg. It was the capital of Virginia in the 1700's, when Virginia was the largest of the colonies. The Capitol, the Governor's Palace, Raleigh Tavern, and many of the houses and shops of Williamsburg have been rebuilt. Guides dressed in colonial costumes show visitors around.

Visitors also get a picture of life in colonial times by visiting some of the old Virginia plantations. Near each big plantation house were other buildings—the kitchen, smokehouse, dairy, coach house, stables, carpenter and weaving shops, and schoolhouse. Farther off from the main house were the cabins of the slaves. Each plantation was a little town in itself. For 100 years or more most travel to and from the Virginia plantations was by boat. Ocean-going vessels loaded bulky hogsheads, or barrels, of tobacco at each planter's landing and sailed off for London. Tobacco was the main crop on the plantations.

Virginia is sometimes called the mother of presidents. George Washington, Thomas



State Bird: Cardinal



State Flower: Dogwood



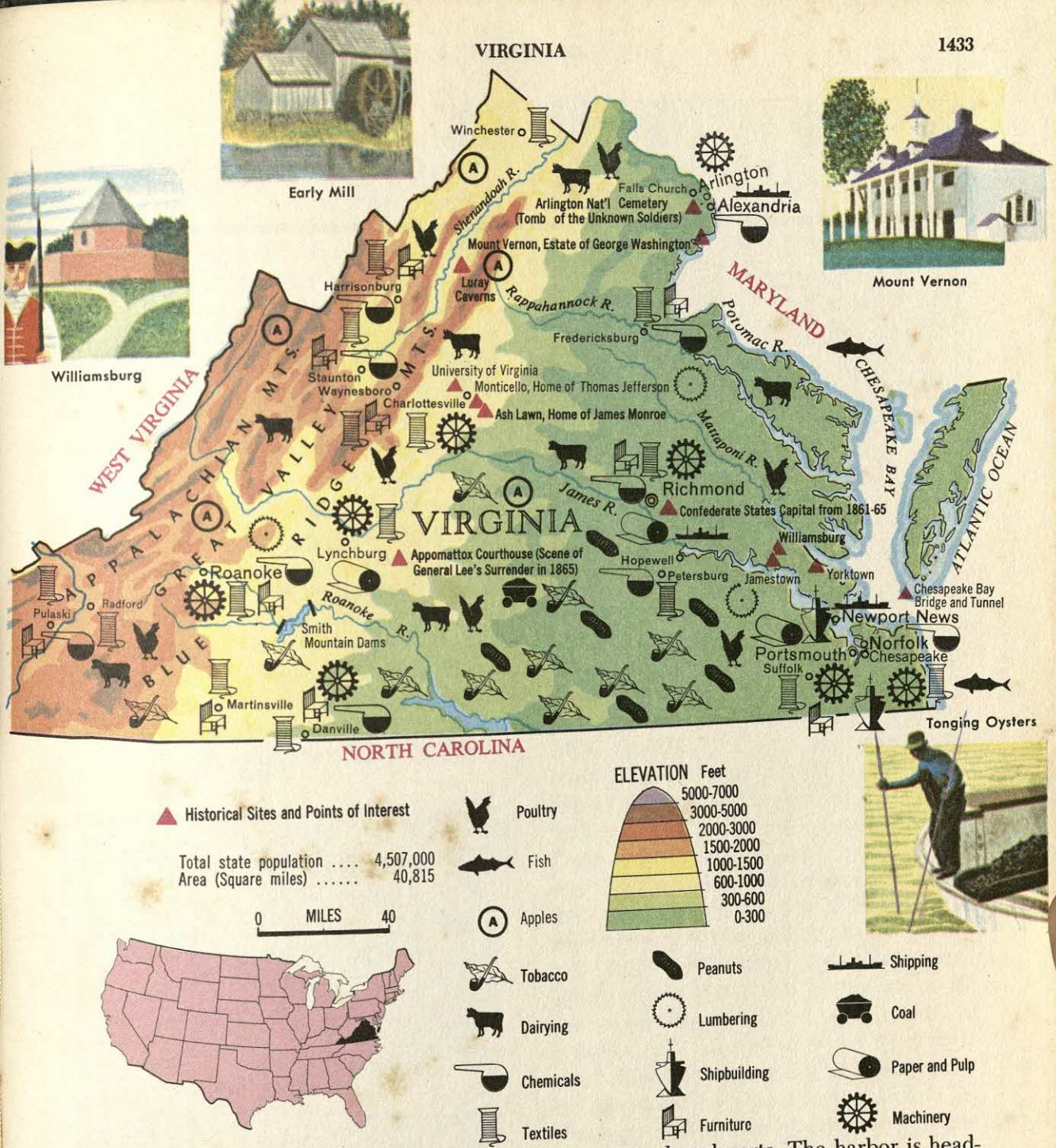
Monticello



Jefferson, James Madison, James Monroe, William Henry Harrison, John Tyler, Zachary Taylor, and Woodrow Wilson were all born in Virginia. Among places tourists visit are Mount Vernon and Monticello, the homes of Washington and Jefferson.

After the planters had used the coastal lowlands for tobacco year after year, the sandy soil wore out. Many moved west to the broad belt of rolling hills and winding valleys of the Piedmont, the plateau between the Blue Ridge Mountains and the coastlands. The red clay soil of the Piedmont made good tobacco land. Later, Pennsylvanians moved south into the Shenandoah Valley. They found it a region of good limestone soil and bluegrass. It became a rich farming area, famous for fine apples and horses. The tree-covered hills and mountains farther west were slow to be settled.

Tobacco is still the biggest crop. The state ranks fifth in tobacco production. Cattle and poultry raising are increasing.



Railroads and good roads, electric power from waterfalls, fertilizers, and coal are among the things that have brought many changes to Virginia. More and more of the people are working in factories. Many work in chemical plants near Richmond, Virginia's capital. Others work in textile plants. Norfolk, Virginia's largest city, Portsmouth, and Newport News, all on the great Hampton Roads Harbor, are big shipbuilding

centers and coal ports. The harbor is headquarters for the U.S. Atlantic fleet. On it, too, is the great Norfolk Navy Yard. Clearly Virginia's greatness is not all in its past. The northern part of the state is crowded with cities and towns to which people from Washington have spread. More and more people from the thickly settled North are moving down to make their homes in this pleasant southern state.



VIRGIN ISLANDS These islands are a part of the West Indies, that long chain that separates the Caribbean Sea from the Atlantic Ocean. As the map shows, some of them belong to the United Kingdom. Those called the Virgin Islands of the United States once belonged to Denmark. The United States bought them in 1917. Altogether they are only about a tenth as big as Rhode Island. The United States wanted them as a naval base. They are in a good place for guarding the Panama Canal.

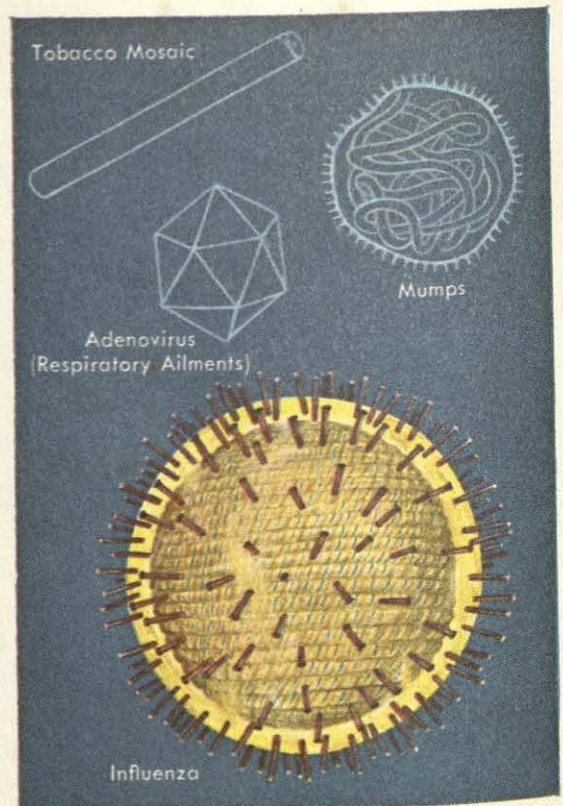
The three largest American islands are St. Thomas, St. Croix, and St. John. Charlotte Amalie, the capital, is the largest city. There are only about 50,000 people living on the islands. Several times that many visitors go there each year. The climate is delightful and the scenery beautiful. Boating, bathing, and deep-sea fishing can be enjoyed the year round. There are excellent shops and hotels. On St. John there is a 15,000-acre national park.

Taking care of the thousands of tourists is one of the chief ways of earning a living on the islands. Raising cattle, sugarcane, and vegetables, and making rum are other ways. There is also much work to be done on ships that come into the many harbors—harbors that once sheltered such famous pirates as Captain Kidd and Blackbeard.

VIRUS Many of our common diseases are caused by viruses. Among them are mumps, influenza, measles, and polio. Viruses cause diseases among plants as well as among human beings and other animals. One of the earliest viruses to be studied causes the disease called tobacco mosaic.

Viruses were a long time being discovered, for they are very tiny. No one had ever seen any till the electron microscope was invented. They are much too small to be seen with light microscopes.

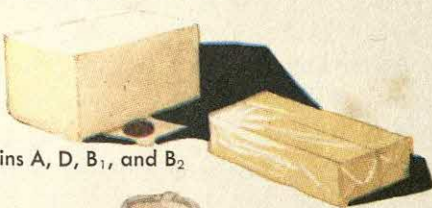
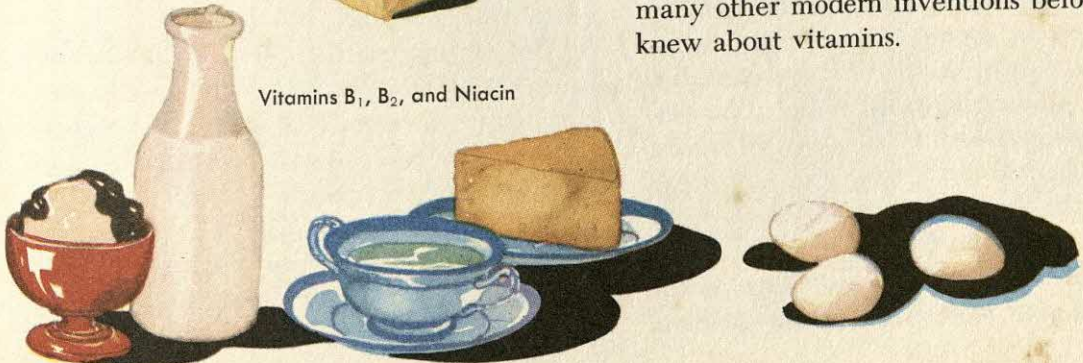
As the picture shows, viruses differ greatly in shape. Some are much simpler than others. But all viruses are puzzling. In some ways they are like living things. In other ways they are not. They can produce other viruses like themselves, but they cannot do so without the help of living cells. Viruses have, moreover, been manufactured in laboratories. We have to think of these tiny particles as being on the borderline between living and nonliving things. (See DISEASE GERMS.)



SOURCES OF VITAMINS

Vitamins A, B₂, K, and C

Vitamins K and C

Vitamins D, B₁, B₂, and NiacinVitamins A, D, B₁, and B₂Vitamins B₁, B₂, and Niacin

VITAMINS In early days sailors that went on long voyages often died of scurvy. Vasco da Gama, on his famous trip around the tip of Africa in 1497, lost 100 men from this disease. Magellan lost many, too. So did other famous explorers. More than 200 years ago English sailors found that they would not have scurvy if on their voyages they drank the juice of limes or lemons. Drinking lime juice became so important on English ships that English sailors were nicknamed "limeys." For a long time no one knew why lime juice prevents scurvy. Now we know that limes and many other fresh fruits and vegetables have in them a remarkable substance called vitamin C. Scurvy is caused by a lack of this vitamin.

Scientists have found that there are many vitamins. They are all important in keeping us well and strong. Vitamins, someone once said as a joke, are things that make you sick if you don't eat them. Vitamin A prevents an eye disease called xerophthalmia. Vitamin B₁ prevents beriberi. Vitamin D prevents rickets. Niacin prevents a disease called pellagra.

Vita in the word vitamin is the Latin word that means "life." The name was made up by Casimir Funk, the Polish-born American scientist who first separated from food some pure vitamin. Getting vitamins from foods is not easy, because they are found in only very tiny amounts. The vitamin Funk got was thiamine, or vitamin B₁. He got it from the outside covering of grains of rice. Funk did not do his work until 1911. People knew about automobiles and airplanes and about many other modern inventions before they knew about vitamins.

VITAMIN CHART

NAME AND WHY NEEDED	WHERE FOUND	WHAT A LACK OF IT MAY CAUSE
Vitamin A Good teeth, skin, and bones. Body growth. Helps eyes adjust to light.	Liver. Milk, cream, butter, and cheese. Yellow and green leafy vegetables.	Rough, dry skin. Retarded growth. Night blindness. Xerophthalmia.
Vitamin B₁ (Thiamine) Good appetite and digestion. Steady nerves.	Meats, especially pork. Breads and cereals. Milk and eggs.	Beriberi. Tiredness. Bad appetite and constipation.
Vitamin B₂ (Riboflavin) Good skin and nerve tissue. Good eyes.	Milk and cheese. Meat and eggs. Green leafy vegetables. Breads and cereals.	Lowered resistance to disease. Tiredness. Loss of appetite.
Vitamin B₁₂ Body growth.	Liver.	Pernicious anemia.
Niacin (Nicotinic Acid) Good appetite and digestion. Good skin and nerve tissue.	Meat, especially liver. Poultry and fish. Peas and beans. Breads and cereals.	Pellagra. Bad appetite and poor digestion.
Vitamin C (Ascorbic Acid) Good teeth, bones, blood vessels. Good gums and muscles.	Citrus fruits. Tomatoes. Green leafy vegetables. Strawberries. Cantaloupe.	Scurvy. Anemia. Slow healing of wounds.
Vitamin D Good teeth and bones. Helps body use calcium and phosphorus.	Fish-liver oils. Vitamin D-enriched milk. Sunshine.	Rickets. Muscular spasms and convulsions.
Vitamin K Normal blood clotting.	Green leafy vegetables. Fruits.	Excessive bleeding from cuts.

Scientists who study foods have made guides to tell us what we should eat. We should get all the vitamins we need if we follow these guides. The foods in the picture, for instance, are rich in vitamins. But if we do not get enough from our food, we can now buy vitamins at the drugstore. It is better, however, to depend mostly on our foods for them. One reason is that in natural foods there may be some vitamins that have not yet been discovered. (See DISEASES; FOODS; HEALTH.)

VOCABULARY In a big English dictionary there are about half a million words. No one person knows or uses all those words—no one, that is, has that big a vocabulary. By the time a child starts to school he usually knows between 2,000 and 3,000 words. His vocabulary grows and grows. A well-educated grown person may have a vocabulary of 50,000 words.

In this encyclopedia there are about 8,000 different words. Any boy or girl who

understands all the words used here has a vocabulary of at least 8,000 words. Of course, some of the words he can read he would not use in writing or speaking. As a matter of fact, everyone who has learned to read and write has three vocabularies: his speaking vocabulary, his writing vocabulary, and his reading vocabulary. A person's reading vocabulary is usually biggest, and his speaking vocabulary smallest.

Many people have studied vocabularies. There are lists of the commonest 500 words, 1,000 words, 2,000 words, and so on. A person could get on surprisingly well with the 1,000 commonest words.

But no one wants to get along with the smallest vocabulary that will do. He can get his ideas across better if he has a good vocabulary. And he can have much more fun reading. Many people make their vocabularies bigger by looking up in the dictionary any new words they come across and using them whenever there is a chance to do so. (See UNIVERSAL LANGUAGES.)

VOICE Long ago no animals had voices. How quiet the world must have been—no frogs croaking, no birds singing, no dogs barking, and no people talking. Of course, in those days there were no frogs, birds, dogs, or people. The kinds of animals that lived then were simpler animals.

The first animals with voices probably used them to call their mates. The voice of the male frog is a croak which tells his mate, "Here I am." His mate then can answer his call by coming close enough for him to see her. Many of the amphibians and reptiles that have voices use them only at mating time.

Birds have calls and songs for their mates and also for their young. Father birds perch high in the branches of trees and sing to their mates and to all the rest of the world. Mother birds sometimes sing, too. Many bird songs are gay and tuneful. Birds also use their voices in another way. When their babies are in danger they warn them by giving a danger note. When a mother hen gives a warning, the babies all run to hide under the mother's wings. A few kinds of birds, such as parrots and parakeets,

can use their voices so well that they can be taught to say words.

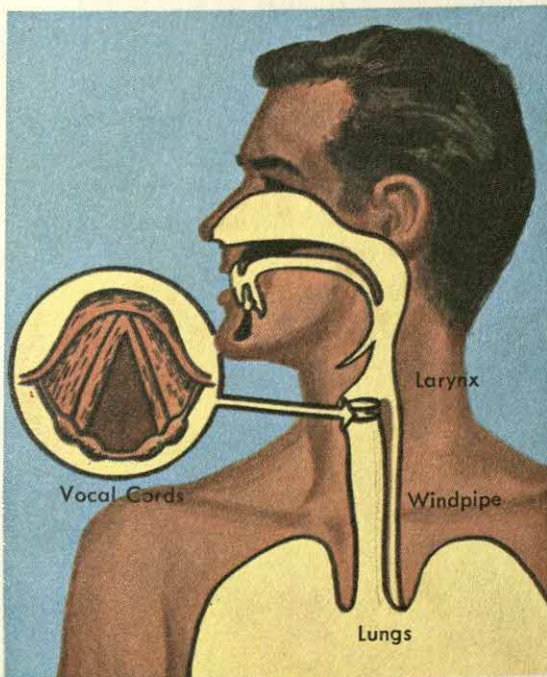
Almost all mammals are able to call their mates and their babies. A few, the giraffe for one, make very feeble sounds.

All animals with voices have vocal cords. These vocal cords are in a voice box of some kind. Our vocal cords are in a voice box called the larynx. The Adam's apple is the front of the voice box.

Air passes through the larynx as it goes in and out of our lungs. Usually no sounds are made as the air goes through the larynx to the lungs. When we talk or sing the sounds are made as air passes between the vocal cords when forced from the lungs out of the body. The air causes the vocal cords to move back and forth very fast, or vibrate. The vibrations cause sound. The tighter our vocal cords are stretched, the higher the sound they make. The more air we force past them, the louder the sound. When we are still children we learn to make our voices high or low, loud or soft.

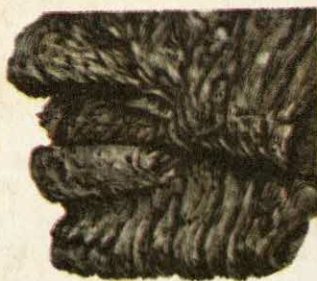
But our vocal cords alone do not make it possible for us to say or sing words. The tongue, the lips, and the teeth are needed. Learning to talk means learning to control not only the vocal cords but also the position of the tongue and lips. Singing well means, in addition, good control of the breath. This, in turn, means good control of the diaphragm, the sheet of muscle that helps us breathe. No wonder it takes years of training to become a great singer.

Every person has a voice pattern of his own. Soon we may have files of voice prints as well as fingerprints for identifying people. (See **SONGBIRDS; SOUND.**)



ROCKS FORMED
FROM LAVA

Rhyolite



Pahoehoe



Obsidian



Aa



Pumice



VOLCANIC BOMB



Andesite



LAVA CAVE

VOLCANO Scattered over the world there are many mountains that at times pour out streams of hot rock and send tons of cinders and ash into the air. These mountains are called volcanoes.

When the people of long ago saw mountains flaming and smoking, they made up stories to explain the flame and smoke. The story the ancient Romans told was that Vulcan, their god of fire, often built a great fire on his forge deep in the earth. The word volcano comes from Vulcan's name.

Volcanoes build themselves. The history of every volcano is very much the same: An opening in the ground leads deep into the earth to a pocket of rock so hot that it is a liquid. Some of this rock may be squeezed up through the opening by the weight of the rock on top of it. Some of it may be forced up by steam and other gases formed underground. These gases may blow the hot rock to bits and shoot it high into the air. The red-hot rock that pours from volcanoes is called lava. It forms solid rock when it cools. The bits of liquid rock shot high into the air cool into volcanic ash or cinders. Some of the larger pieces are called volcanic bombs.

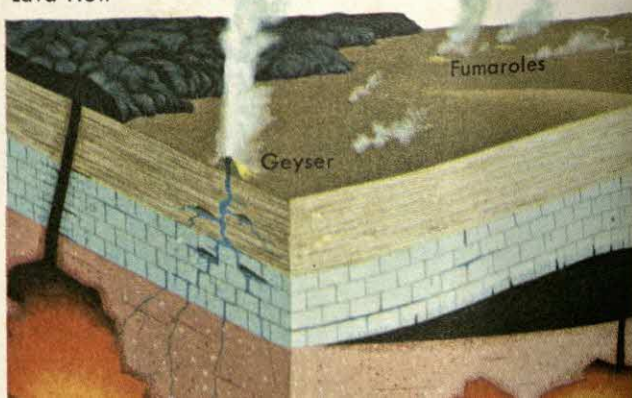
Little by little the hardened lava and ash pile up around the opening through which the hot rock was forced up. In time a cone-shaped mountain is formed.

At the top of a volcanic cone there is always a saucer-shaped hollow. It is called a crater. Sometimes the crater of a volcano has a lake of bubbling red-hot rock in it.

Not all volcanoes build themselves on land. Some rise from the bottom of the

VOLCANO	WHERE LOCATED	HEIGHT IN FEET
*Aconcagua	Argentina-Chile	22,835
*Adams	Washington	12,307
*Baker	Washington	10,750
Bogoslof	Aleutian Islands	Nearly submerged
Cotopaxi	Ecuador	19,344
Erebus	Antarctica	12,450
Etna	Sicily	10,705
*Fuji	Japan	12,389
*Hood	Oregon	11,245
Iztaccihuatl	Mexico	16,883
Katmai	Alaska	7,000
*Kenya	East Africa	17,058
*Kilimanjaro	East Africa	19,340
Lassen	California	10,453
Mauna Loa	Hawaii	13,680
Misti	Peru	19,110
*Orizaba	Mexico	18,700
Papandayan	Java	8,744
Parícutin	Mexico	9,100
Pelé	Martinique	4,430
Popocatepetl	Mexico	17,887
*Rainier	Washington	14,410
*San Francisco	Arizona	12,611
*Shasta	California	14,162
Vesuvius	Italy	4,190
Wrangell	Alaska	14,005

Lava Flow



sea. Many of the islands in the Pacific Ocean are the tops of volcanic mountains.

When lava and ash are coming from a volcano, we say that the volcano is erupting. Not very many volcanoes erupt all the time. If a volcano has been quiet for a hundred years or so, we say that it is dead. But no one can be sure that a volcano will never erupt again. Volcanoes that are not dead are called active volcanoes.

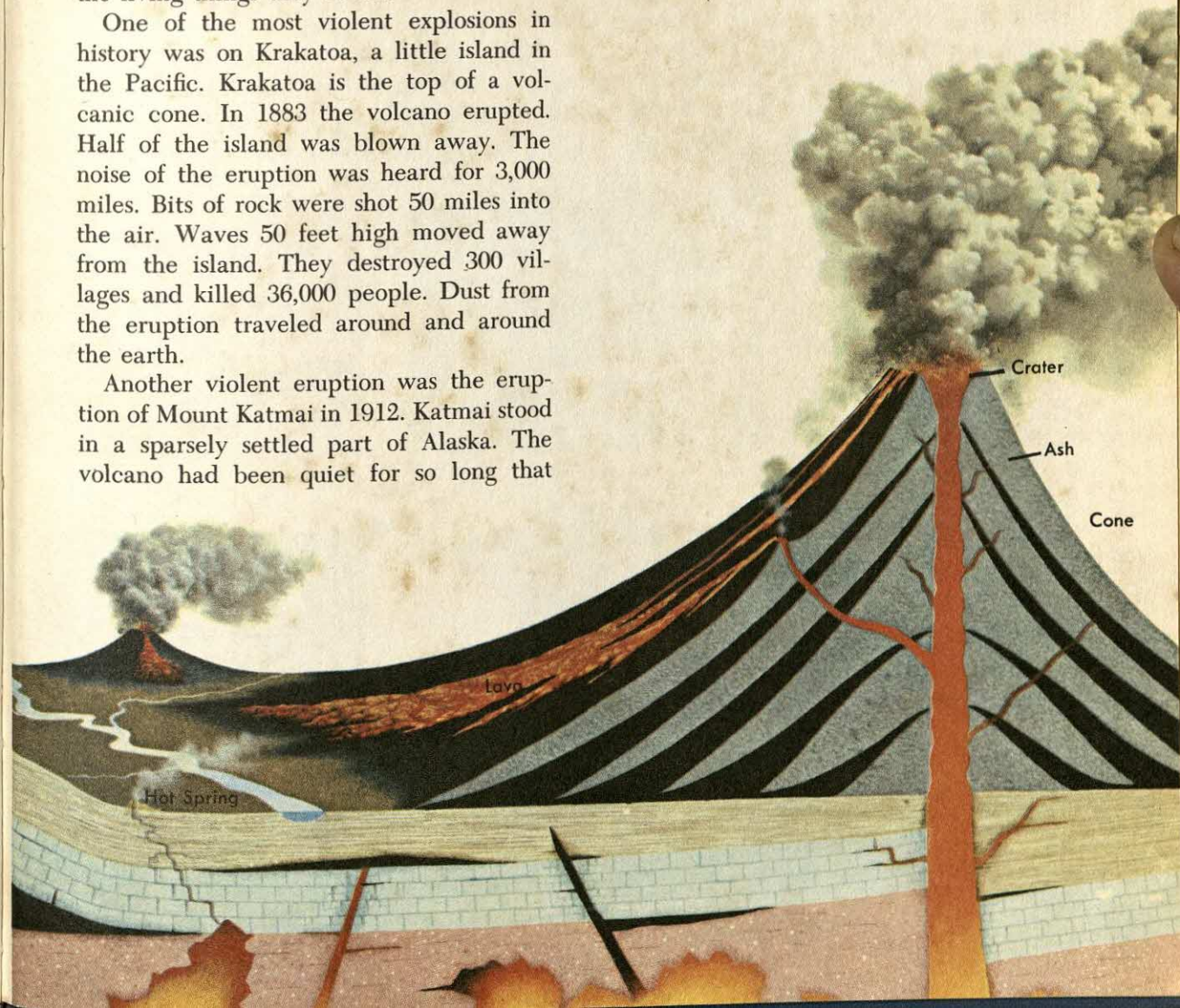
A volcano may not do much damage when it erupts. But it may do a great deal. Often there are earthquakes when a volcano is erupting. If the volcano is under the sea, huge waves are caused. These waves may wash away villages on the seashore. They may drown many people, too. Of course, on land hot lava and ash kill all the living things they cover.

One of the most violent explosions in history was on Krakatoa, a little island in the Pacific. Krakatoa is the top of a volcanic cone. In 1883 the volcano erupted. Half of the island was blown away. The noise of the eruption was heard for 3,000 miles. Bits of rock were shot 50 miles into the air. Waves 50 feet high moved away from the island. They destroyed 300 villages and killed 36,000 people. Dust from the eruption traveled around and around the earth.

Another violent eruption was the eruption of Mount Katmai in 1912. Katmai stood in a sparsely settled part of Alaska. The volcano had been quiet for so long that

there were not even any stories among the natives of Alaska about its eruptions. Suddenly on the sixth of June it introduced itself to the world with a terrific explosion. The mountain blew off its whole top. Explorers who went into the region after the eruption found a valley nearby with many cracks and little craters in it from which steam and gases were pouring. They gave the valley the name of the "Valley of Ten Thousand Smokes."

There are several active volcanoes in Alaska and Hawaii but only one in the rest of the United States. This is Mount Lassen in California. The table on the opposite page names some of the world's best-known volcanoes. Those marked with a star are supposed to be dead. But of course no one can be sure. (See PARÍCUTIN; VESUVIUS.)



VTOL Airplanes need long runways for taking off and landing. These long runways would not be needed and airports could be much smaller if planes could take off by rising straight up and could land by settling straight down. For years airplane designers have been working on planes that could make vertical takeoffs and landings. VTOL stands for "vertical takeoff and landing."

Helicopters take off and land vertically, and they are useful in dozens of ways. But what is needed is a dependable aircraft that, except when taking off and landing, flies like an ordinary plane. Even the fastest helicopters are slow compared with the fastest planes. Besides, helicopters are harder to fly than planes.

Many different ideas for VTOL craft have been or are being tried out. The pictures illustrate a few of these ideas.

The Hummingbird is a jet that flies forward like any other plane. But in taking off and landing, the hot exhaust gases from

its engines are sent downward through pipes and nozzles instead of backward. The jets of gas lift the plane from the ground or let it settle down slowly from the air. Sketch 3 shows a similar VTOL plane.

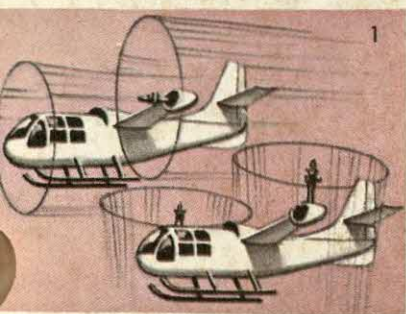
The plane in Sketch 1 has rotors like helicopter rotors on its wings. In landing and takeoff these rotors face up. In moving ahead they face forward.

Sketch 2 shows a plane with big fans in its wings. In taking off or landing these fans send great blasts of air downward.

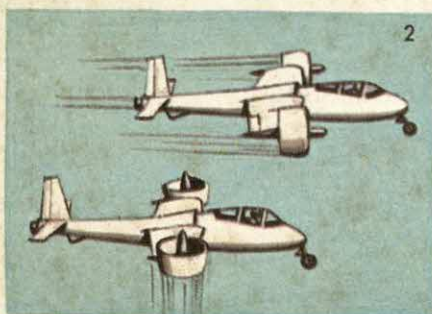
In going forward the wings and engines of the propeller plane in Sketch 4 are in the usual position. But in takeoff and landing they are tilted up.

A fifth type of VTOL craft has a rotor on top for takeoff and landing. In flying ahead the rotor folds up and the plane is like an ordinary jet plane.

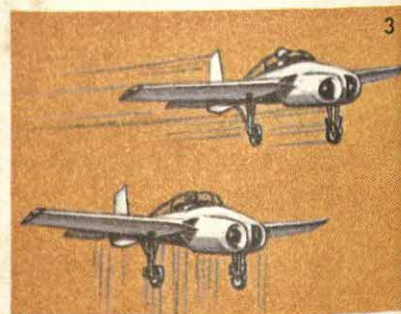
Still another way is to use rockets to take off and land. Most of the experimenting with VTOL planes has been with military aircraft. (See HELICOPTER.)



Tilted Rotor



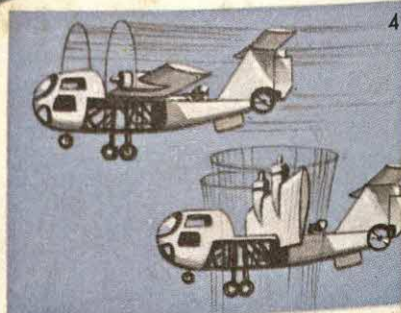
Ducted Fan



Thrust Deflection



Hummingbird



Tilted Wing

